Identifying spatially rare deep sea coral communities in the Gulf of Maine (NW Atlantic)

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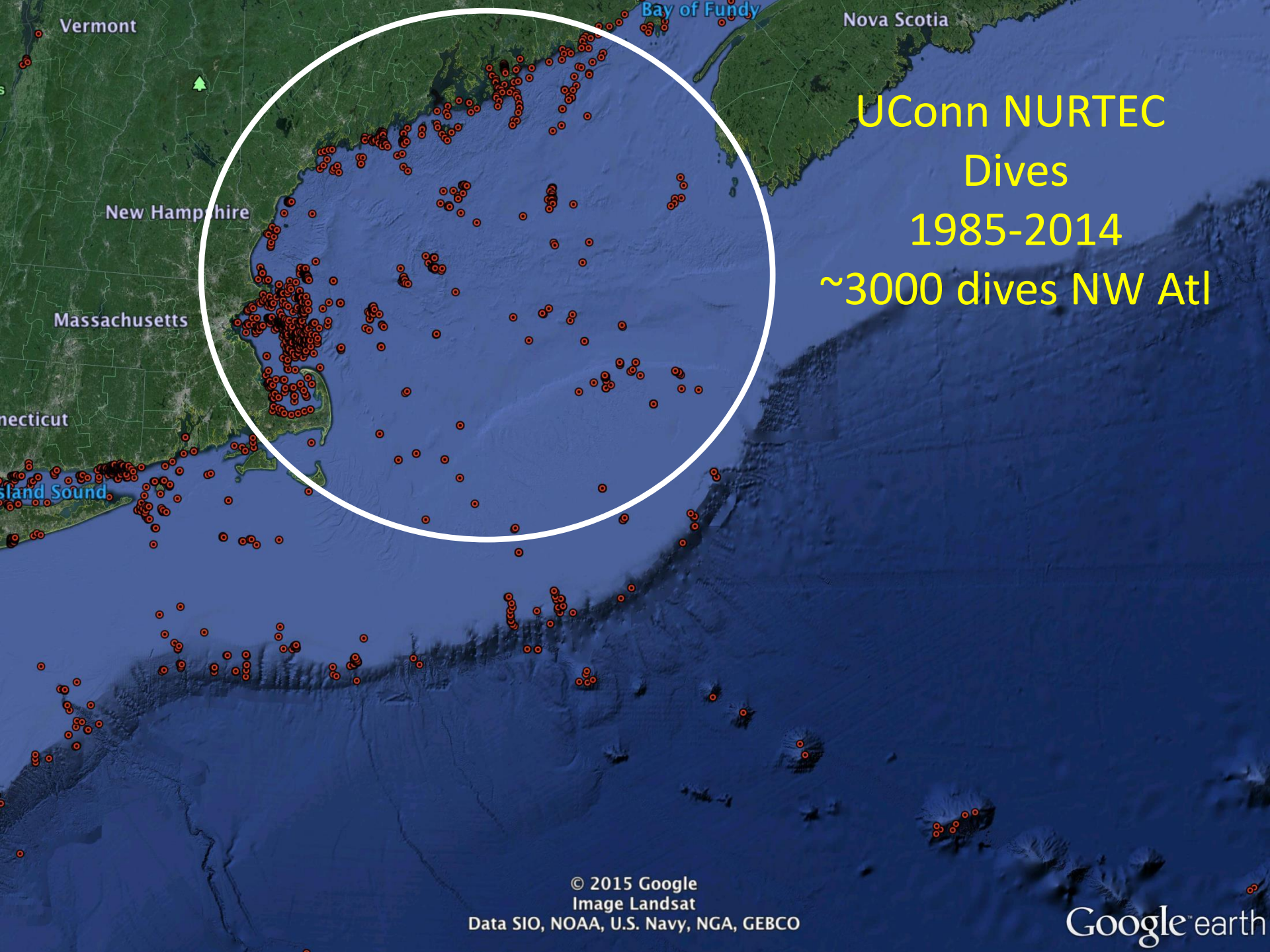
[6]NOAA National Marine Fisheries Service, National Systematics Laboratory

"A significant part of the problem regarding conservation of deep-water corals … is the lack of a comprehensive knowledge about the distribution of … coral taxa in this region.

"… however, … along the American east coast deep-water corals have been known since at least 1862 when Verrill documented the presence of a *Primnoa "on Georges Bank" (Verrill 1862).*

"Wigley (1968) described *Paragorgia as a common component of the gravel fauna of the Gulf of Maine and stated that representative gravel faunas occurred on "Cashes Ledge, parts of Great South Channel, the northeastern part of Georges Bank, western Browns Bank, Jeffreys Ledge, and numerous other smaller banks in the Gulf of Maine region."*

Watling & Auster 2005

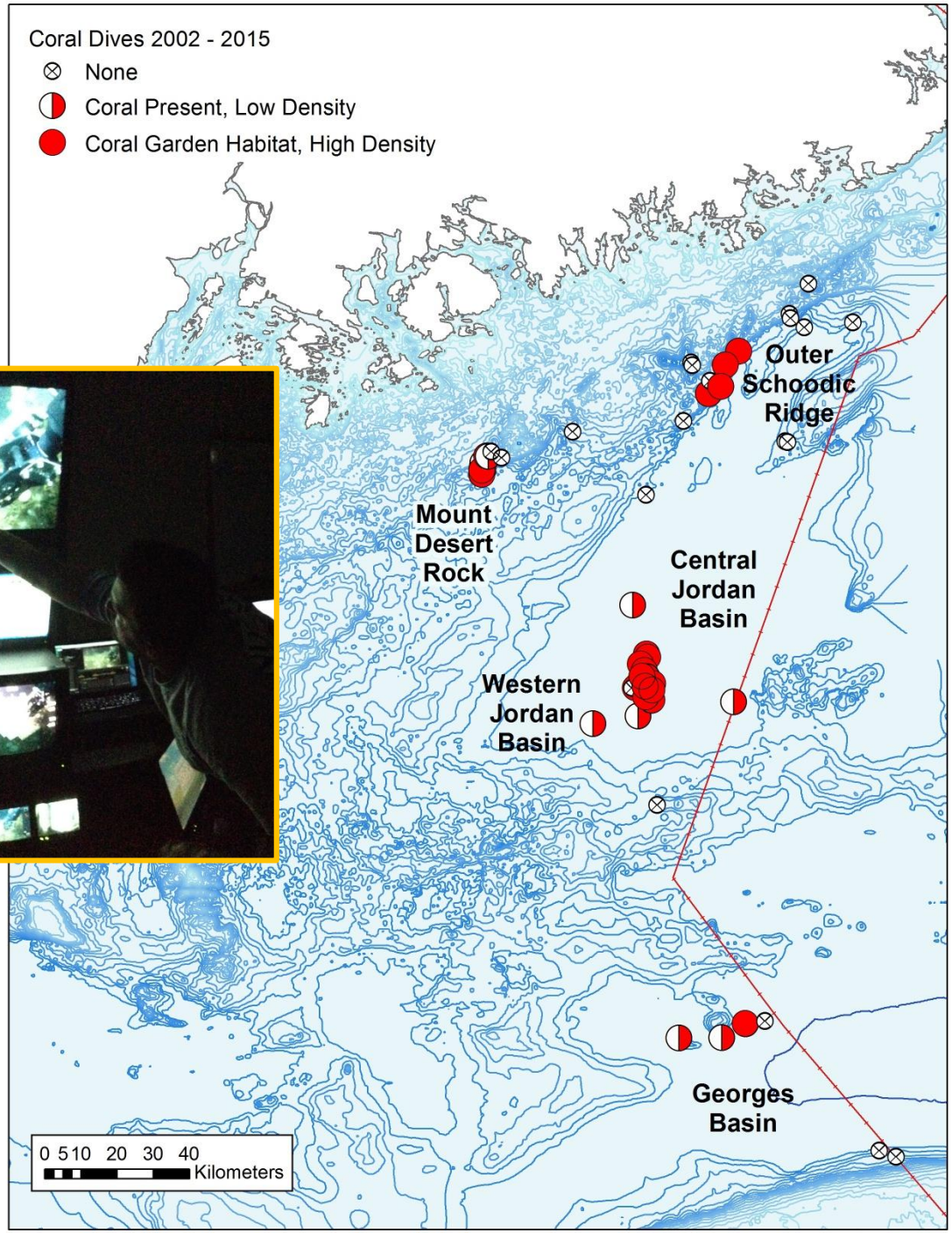

Vermont
Bay of Fundy
Nova Scotia
New Hampshire
Massachusetts
necticut
sland Sound
UConn NURTEC
Dives
1985-2014
~3000 dives NW Atl
© 2015 Google
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google earth

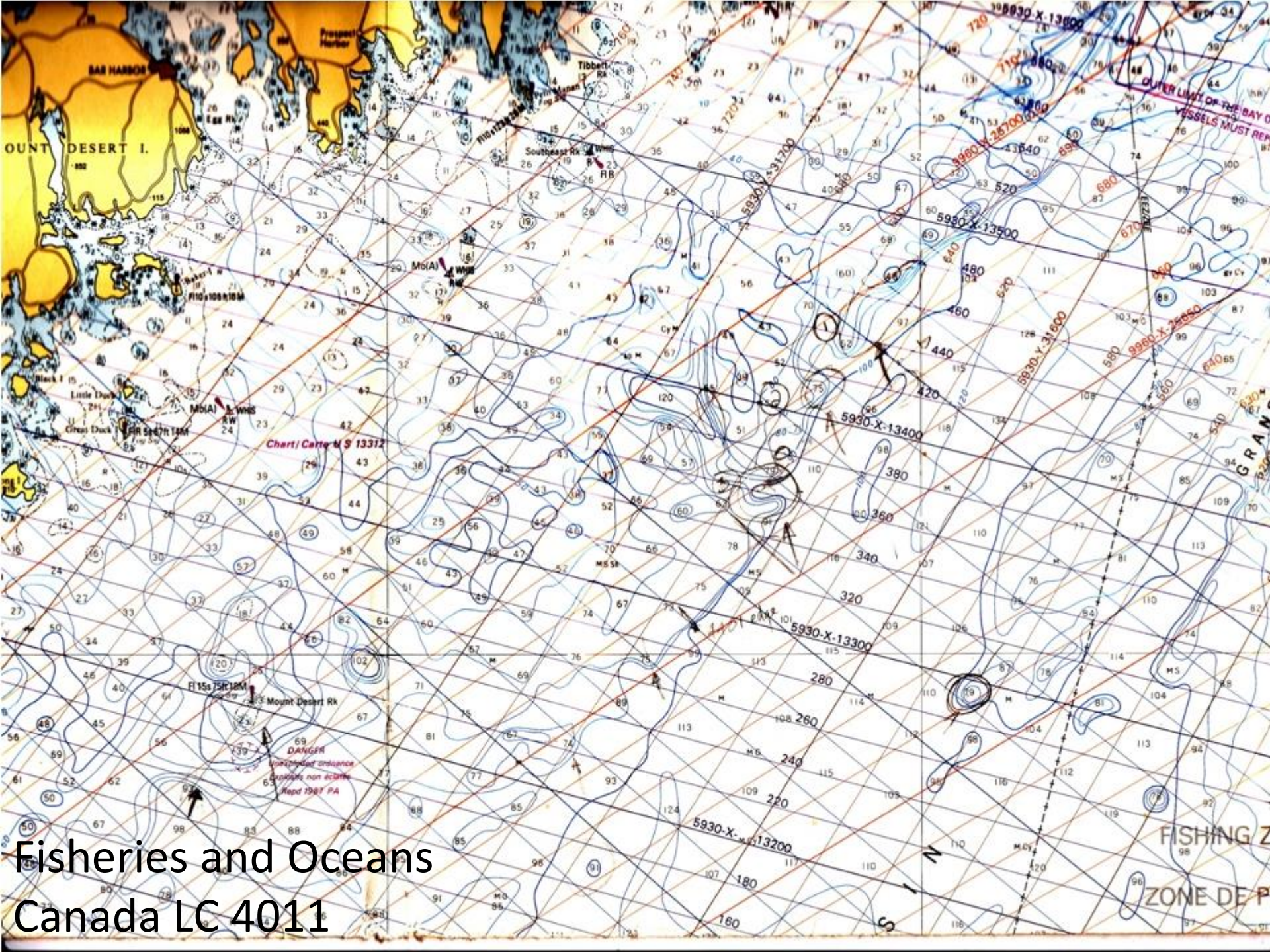
We came

We saw

We made a map!

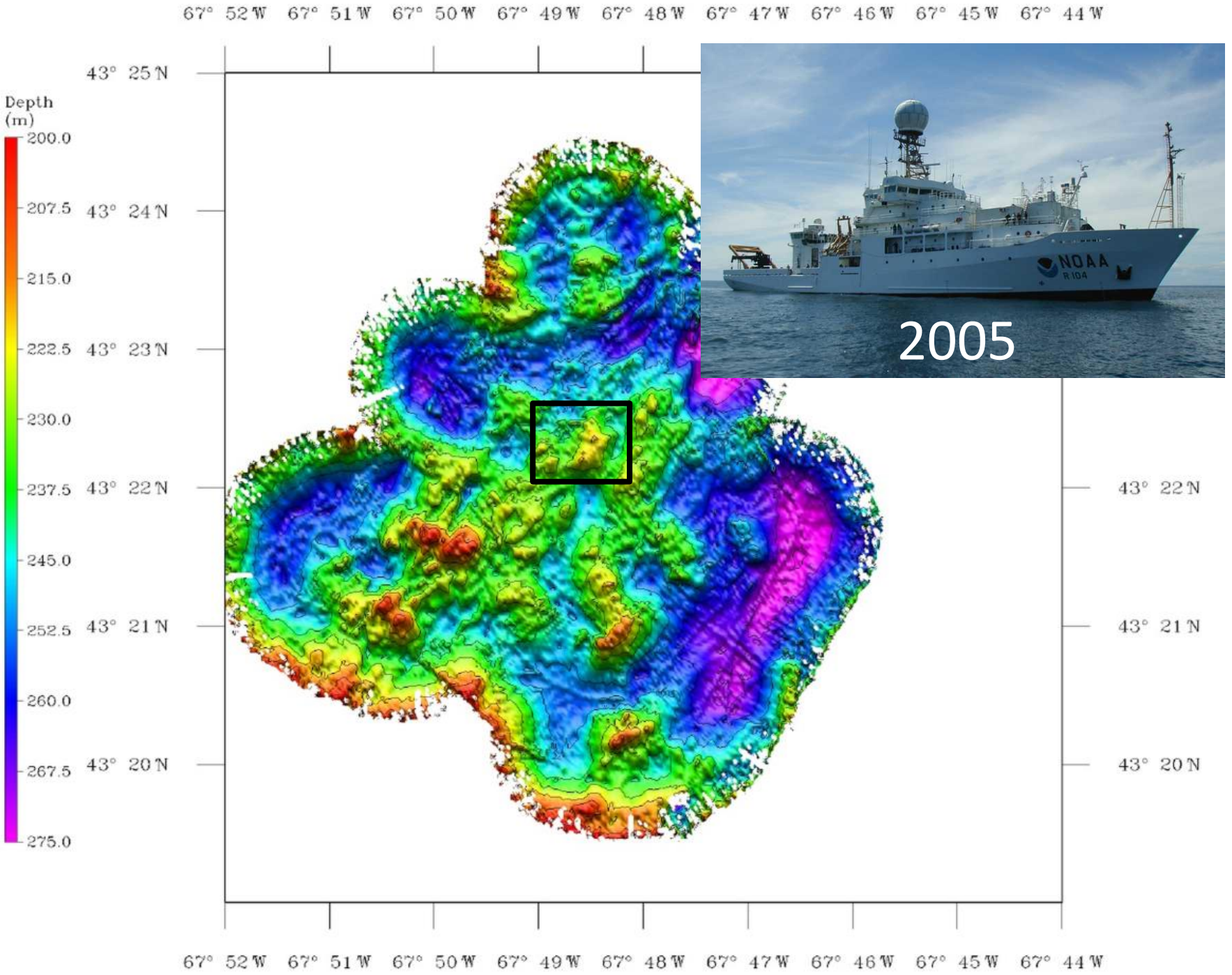
"Coral garden" habitat = 0.1 colony m-2 (sensu ICES 2007).



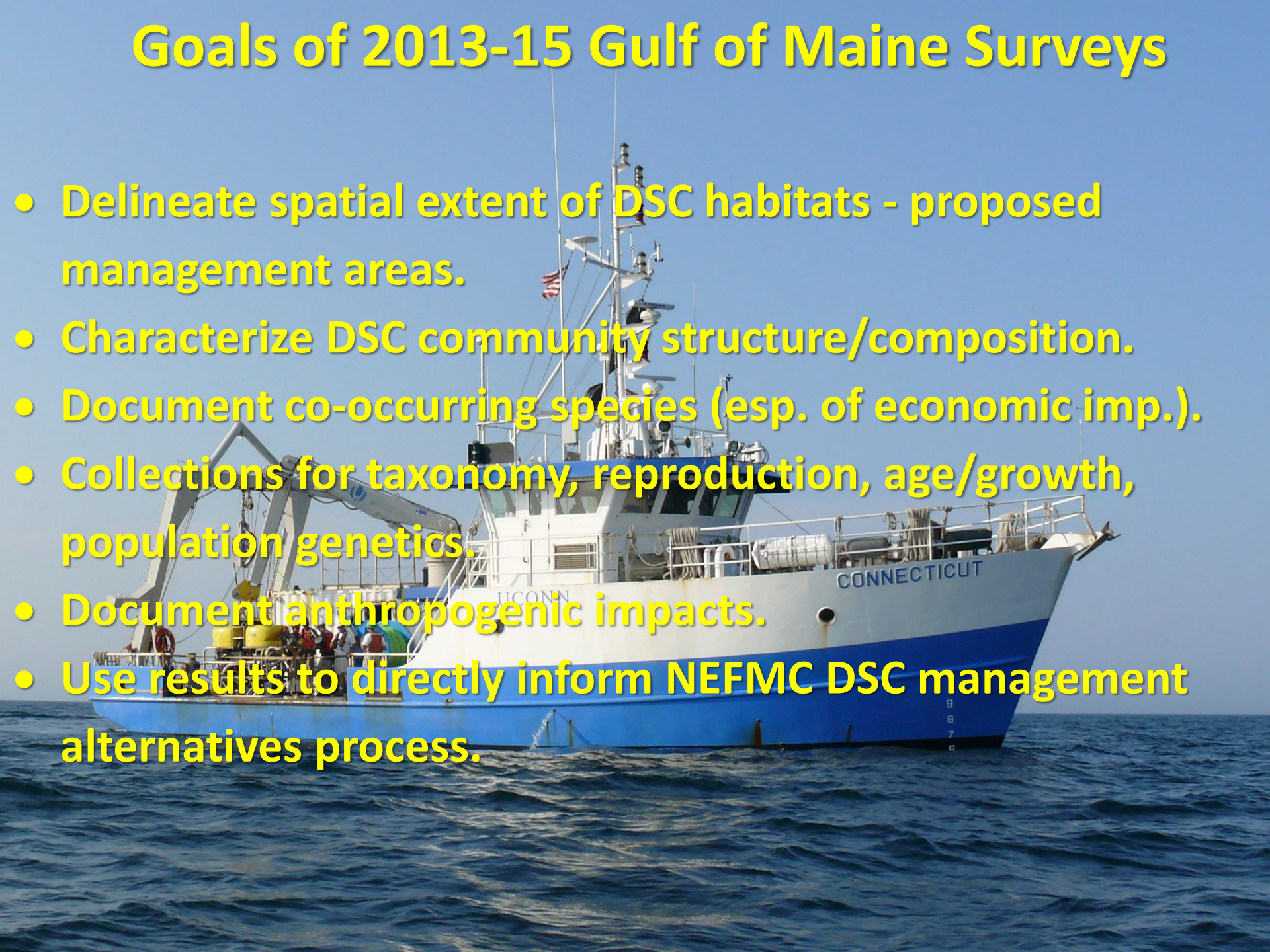


Fisheries and Oceans
Canada LC 4011

2002-03 Surveys – Mount Desert Rock & Western Jordan Basin Areas

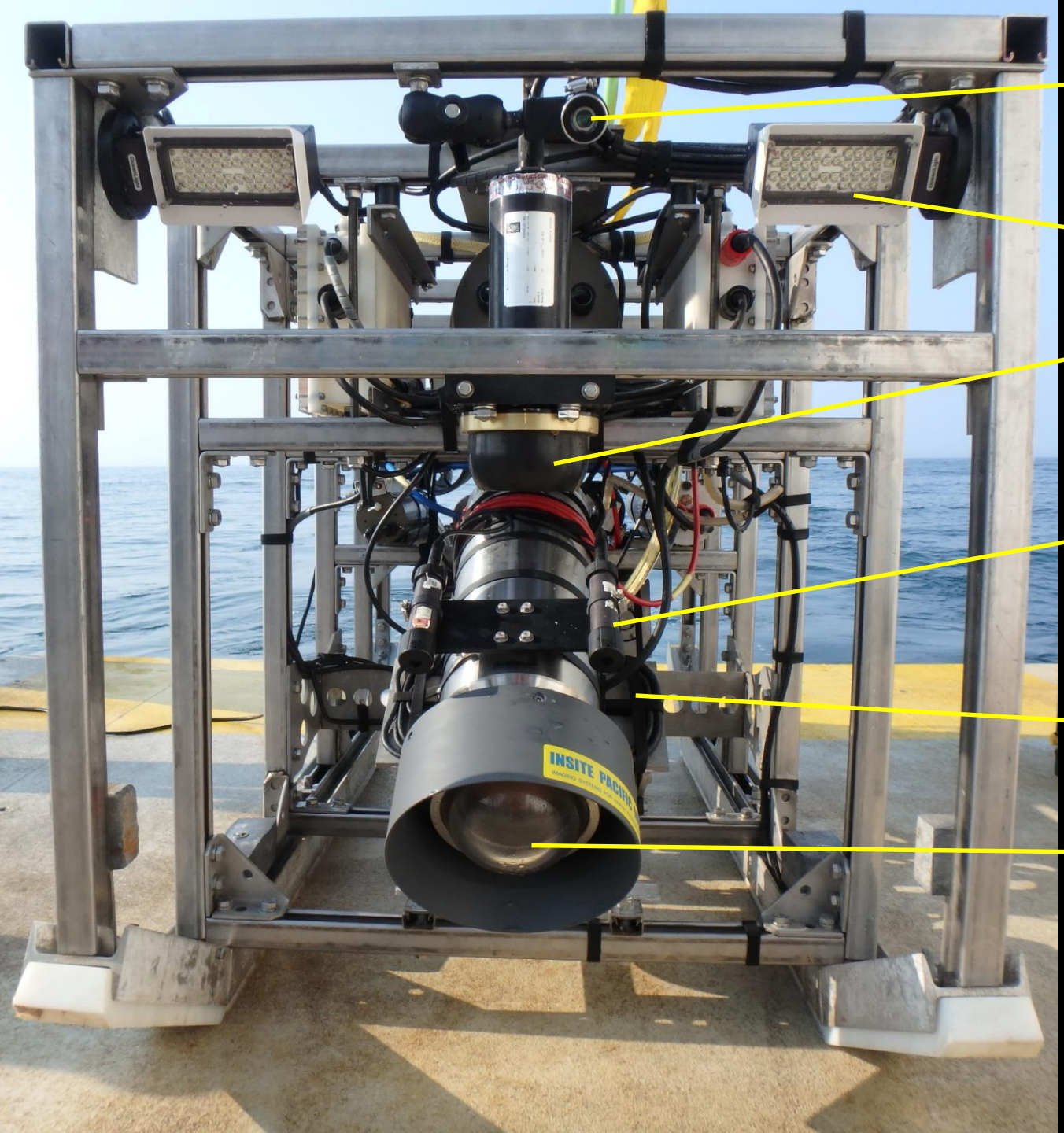

67° 52 W
67° 51 W
67° 50 W
67° 49 W
67° 48 W
67° 47 W
67° 46 W
67° 45 W
67° 44 W
43° 25 N
43° 24 N
43° 23 N
43° 22 N
43° 21 N
43° 20 N
Depth (m)
200.0
207.5
215.0
222.5
230.0
237.5
245.0
252.5
260.0
267.5
275.0
NOAA
R 104
2005

Goals of 2013-15 Gulf of Maine Surveys



- Delineate spatial extent of DSC habitats - proposed management areas.
- Characterize DSC community structure/composition.
- Document co-occurring species (esp. of economic imp.).
- Collections for taxonomy, reproduction, age/growth, population genetics.
- Document anthropogenic impacts.
- Use results to directly inform NEFMC DSC management alternatives process.


ISIS2 towed camera sled



Pilot SD Video Camera

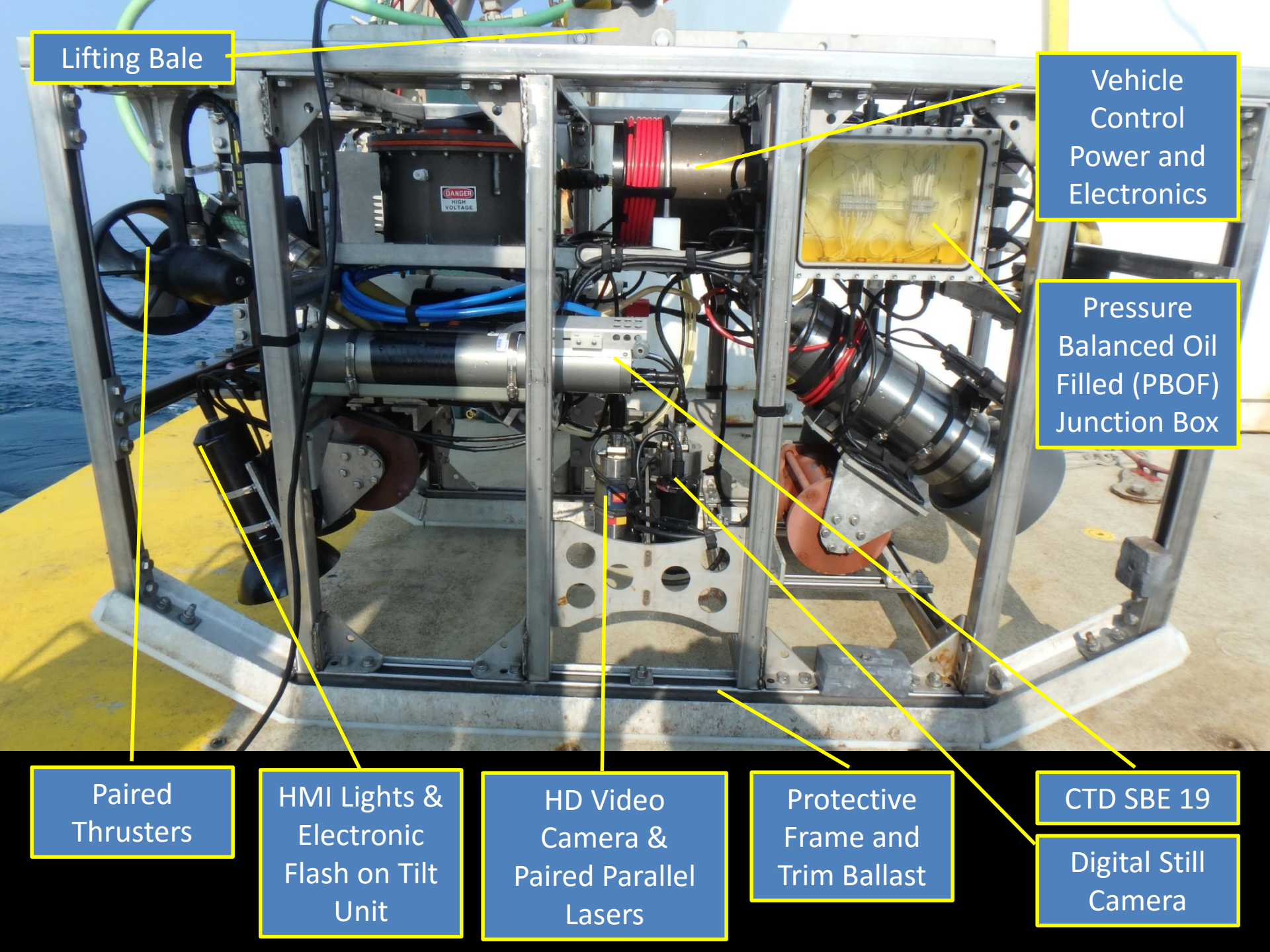
LED light

Sector-Scanning Sonar

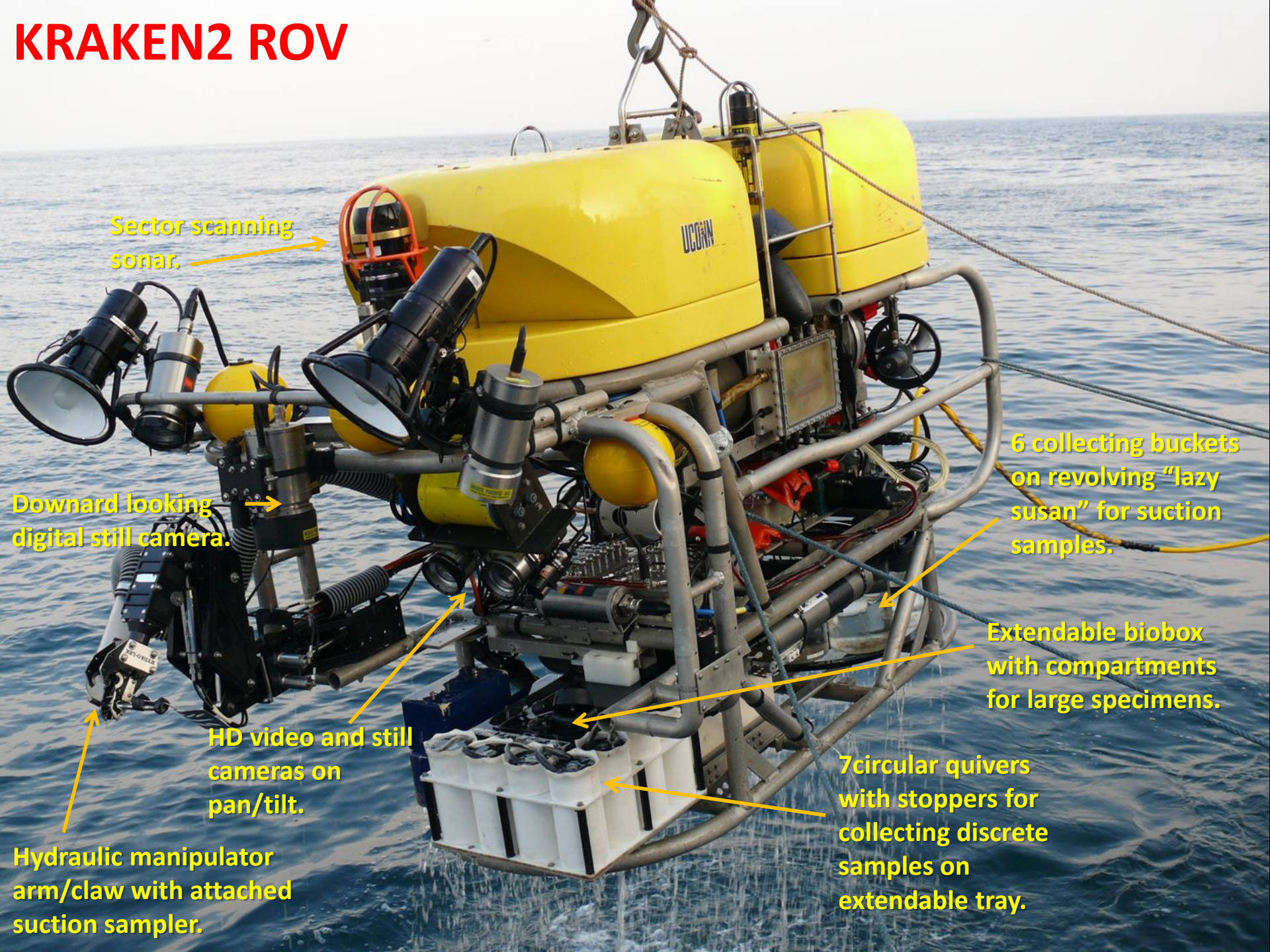
Paired Parallel Lasers (20 cm)

Controlled Tilt Unit

HD Video Camera


Lifting Bale
Vehicle Control Power and Electronics
Pressure Balanced Oil Filled (PBOF) Junction Box
Paired Thrusters
HMI Lights & Electronic Flash on Tilt Unit
HD Video Camera & Paired Parallel Lasers
Protective Frame and Trim Ballast
CTD SBE 19
Digital Still Camera

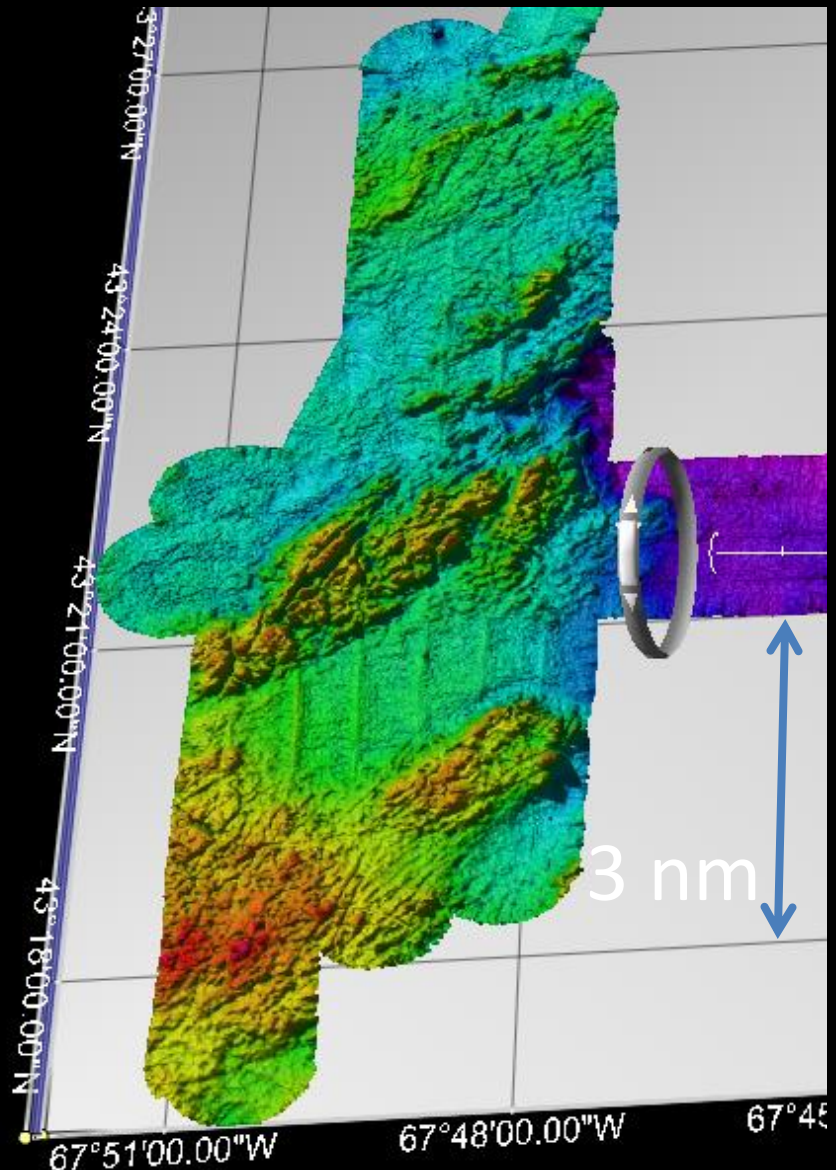
KRAKEN2 ROV

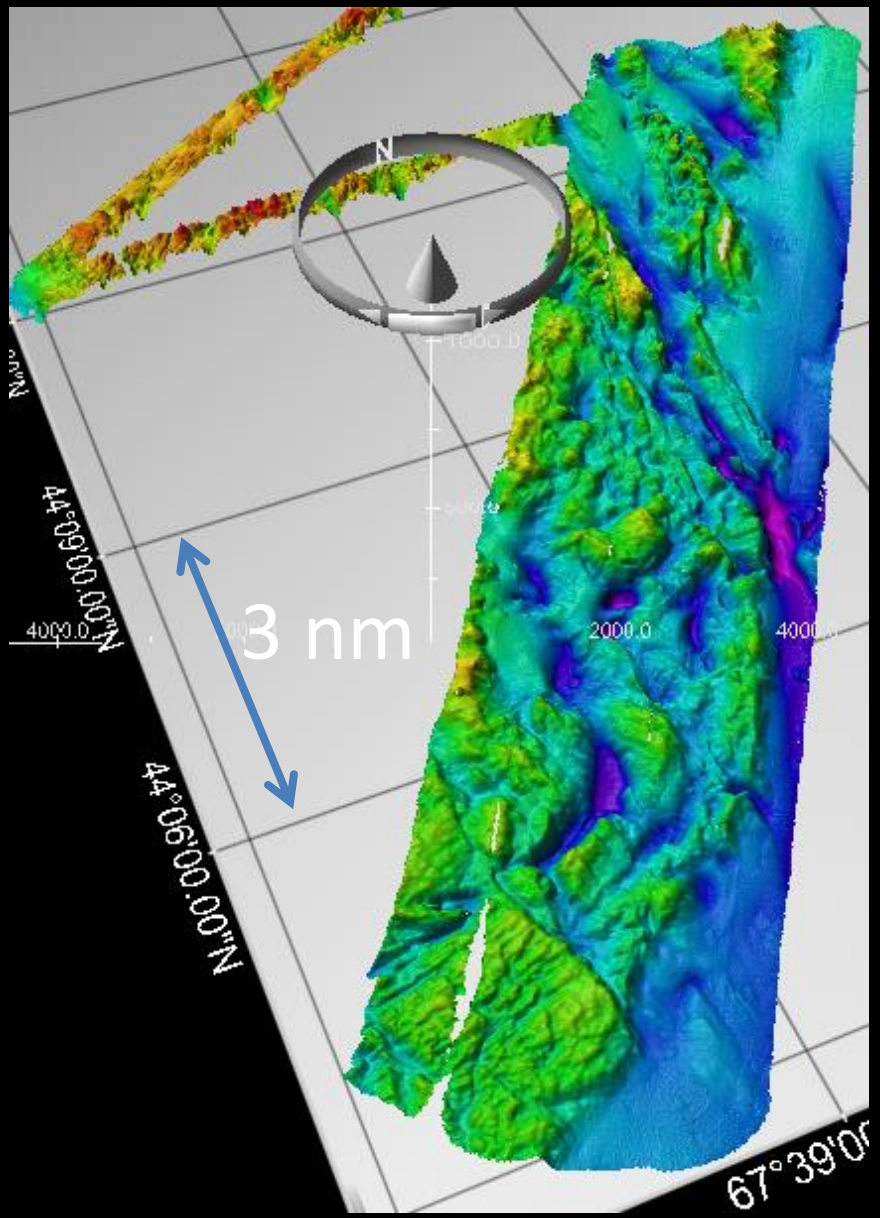

Sector scanning sonar.
Downard looking digital still camera.
HD video and still cameras on pan/tilt.
Hydraulic manipulator arm/claw with attached suction sampler.
6 collecting buckets on revolving "lazy susan" for suction samples.
Extendable biobox with compartments for large specimens.
7circular quivers with stoppers for collecting discrete samples on extendable tray.

MAPS

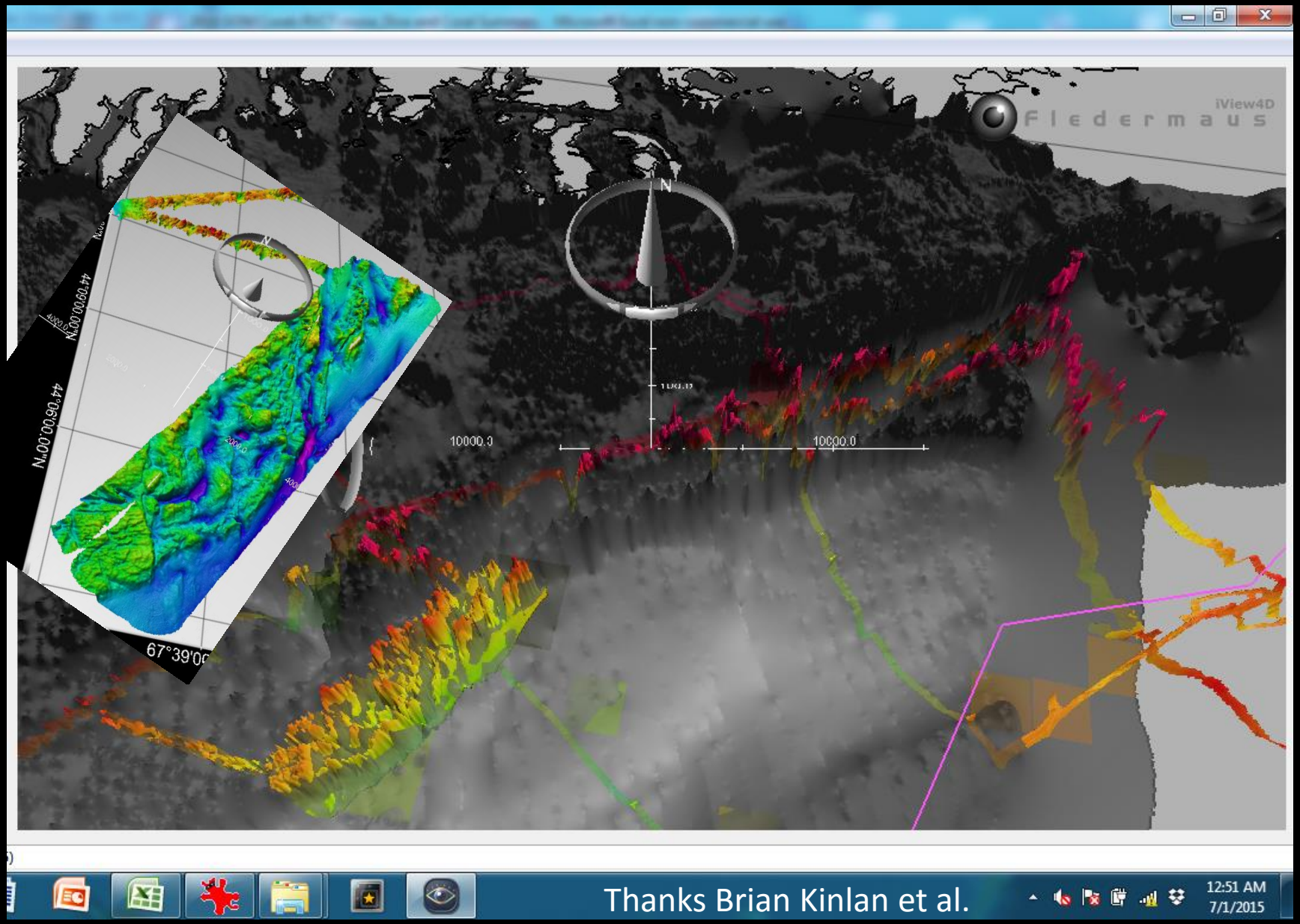
2013 – Existing bathymetric maps

2014 – New multibeam of primary areas





MAPS 2015 – Combined bathy with models

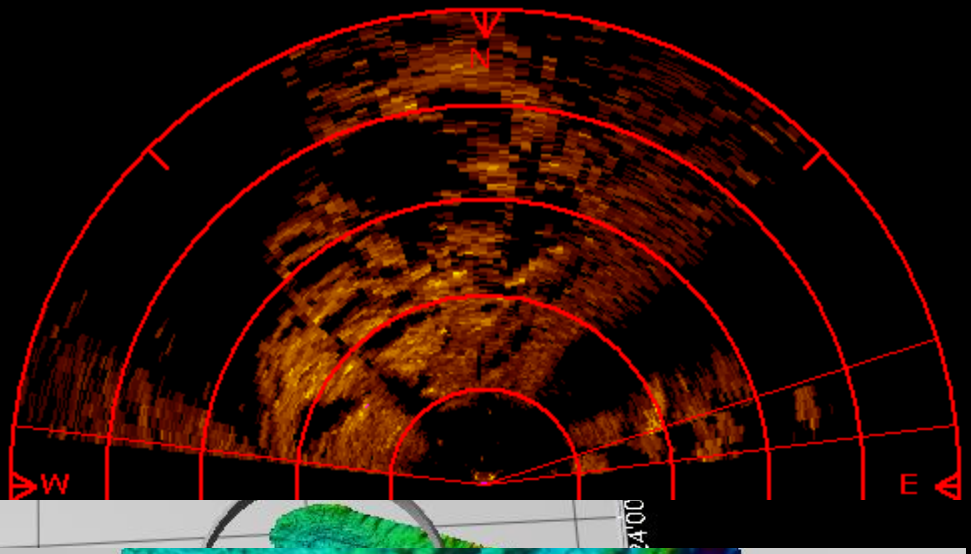


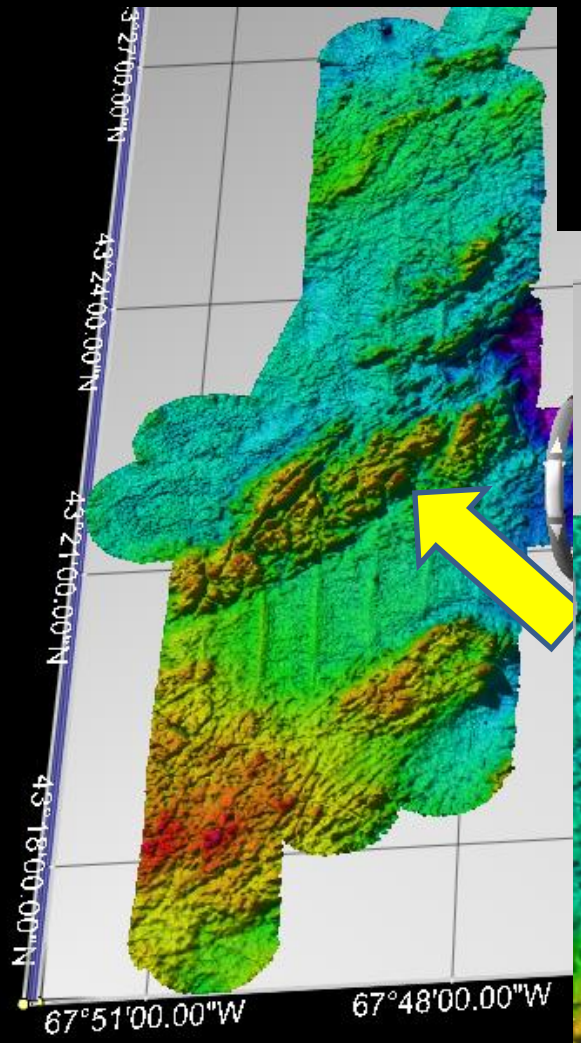
Thanks Brian Kinlan et al.

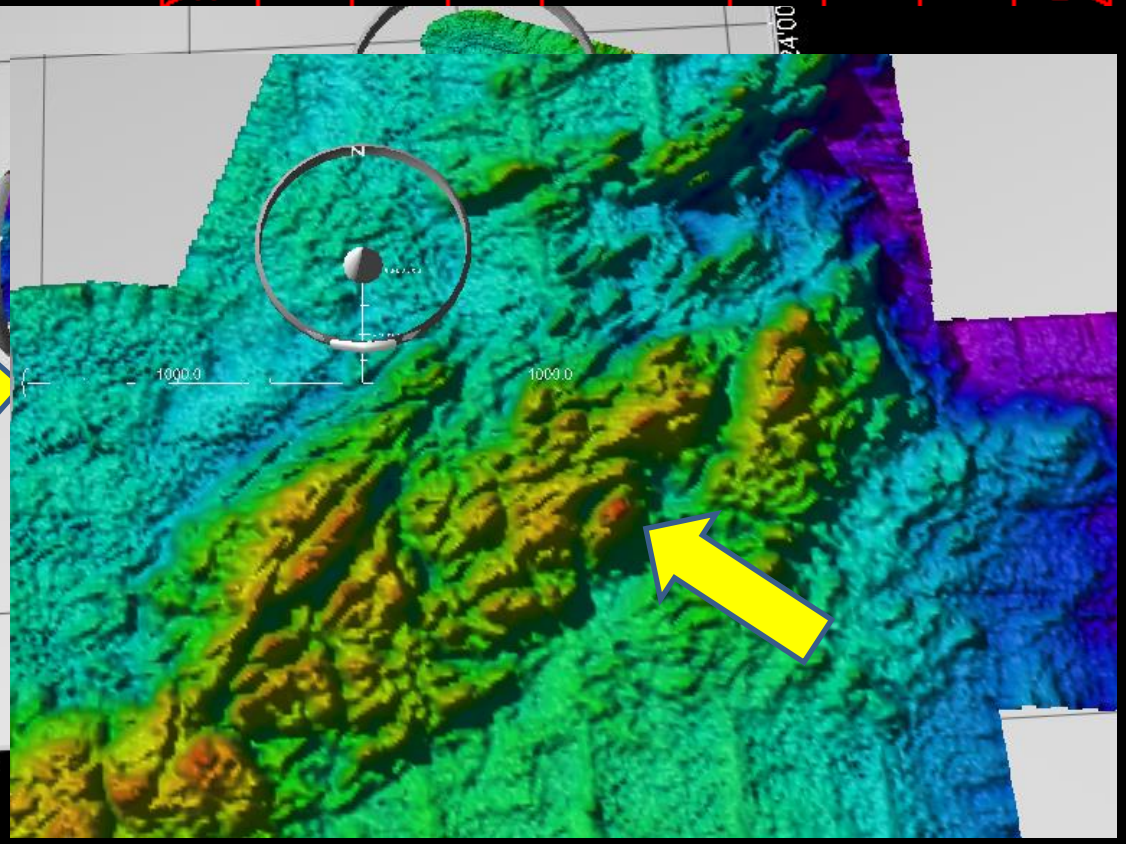
DIVE 7

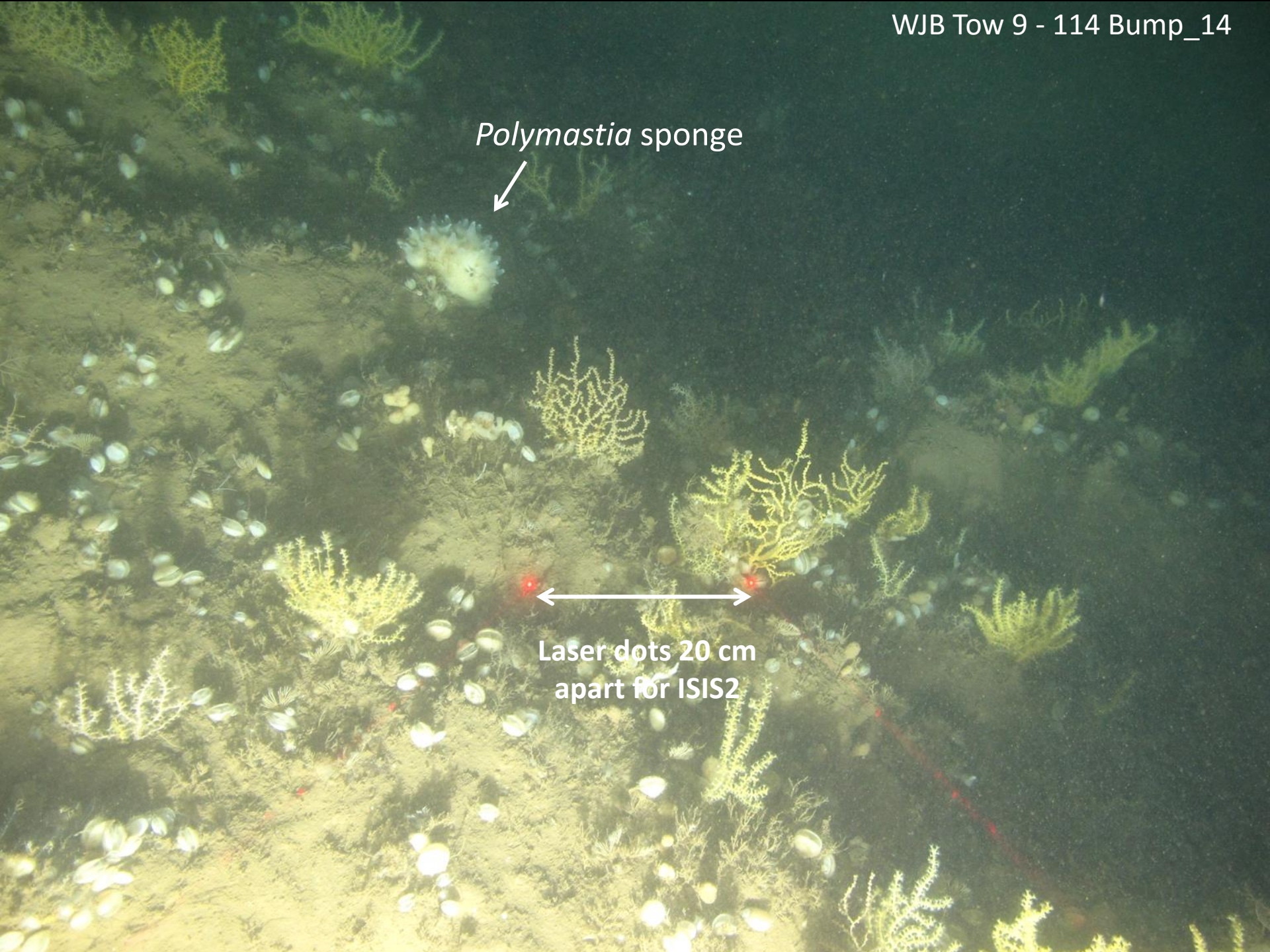
Western Jordan Basin

114 Bump

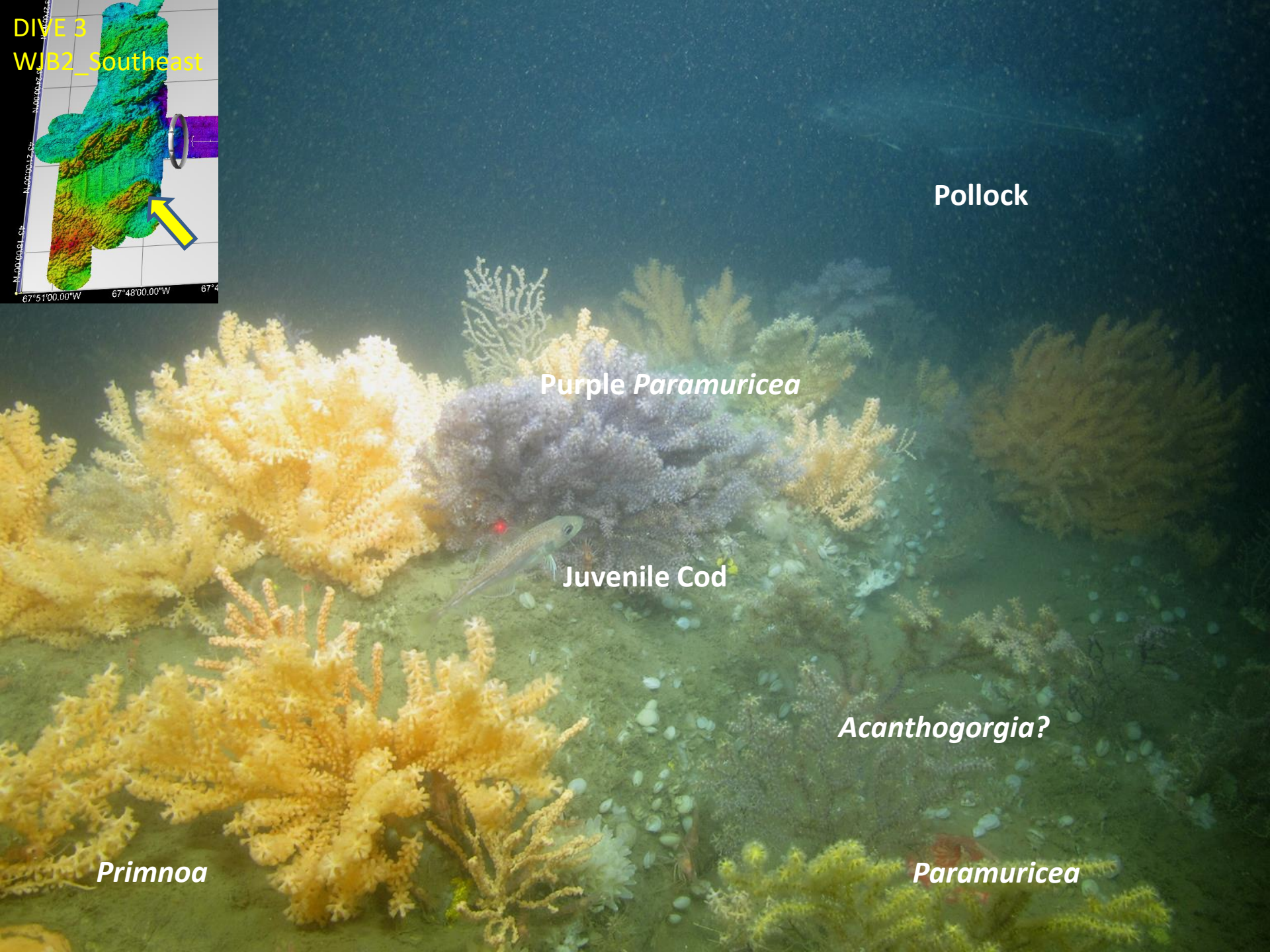


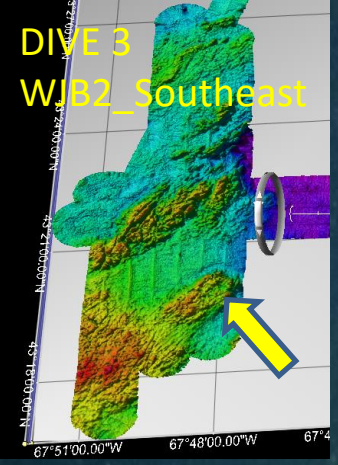




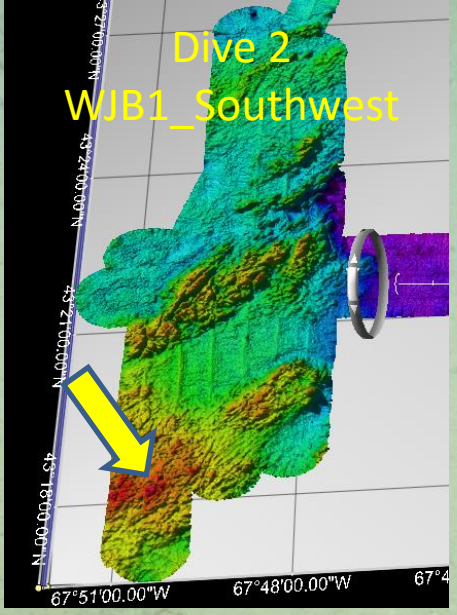

WJB Tow 9 - 114 Bump_14
Polymastia sponge
Laser dots 20 cm
apart for ISIS2


Dive 7
WJB4_114 Bump
67°51'00.00"W
67°48'00.00"W


DIVE 3
WJB2_Southeast
67°51'00.00"W
67°48'00.00"W
Pollock
Purple *Paramuricea*
Juvenile Cod
Acanthogorgia?
Primnoa
Paramuricea



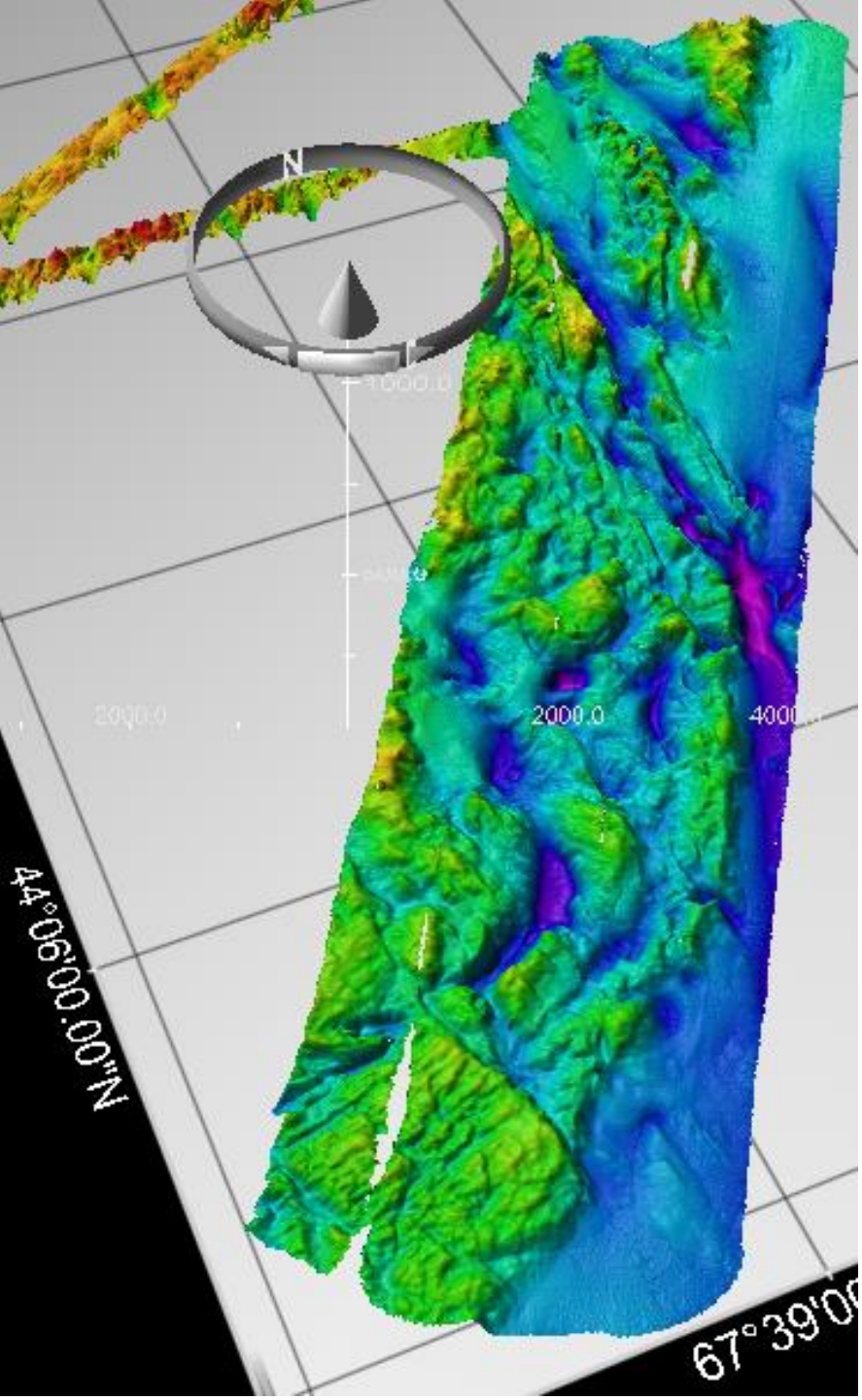
Laser dots 10 cm
apart for Kraken2

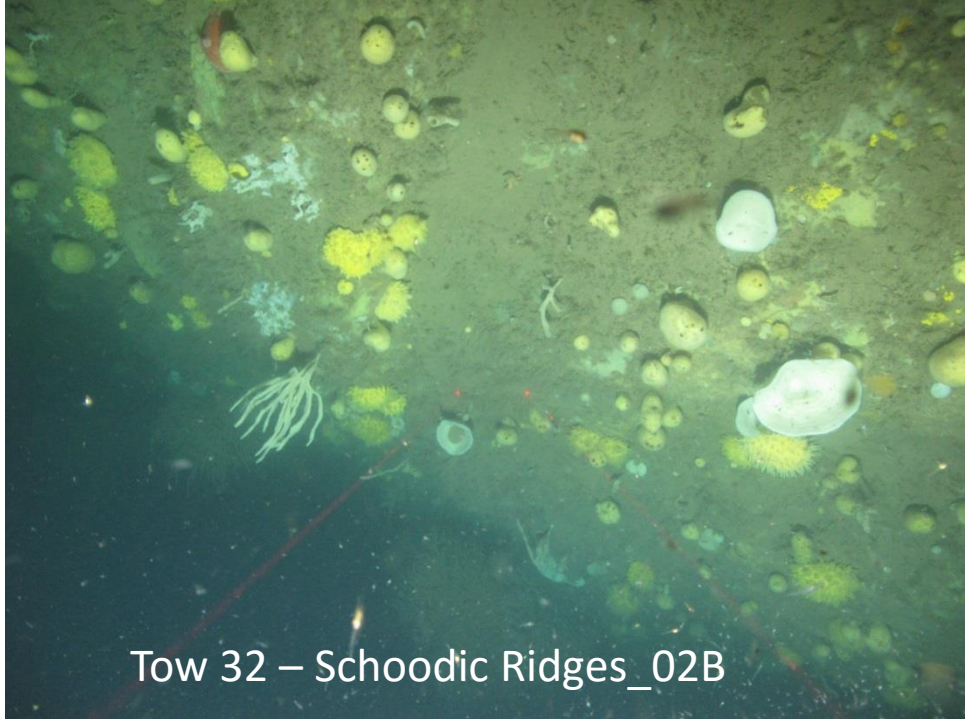


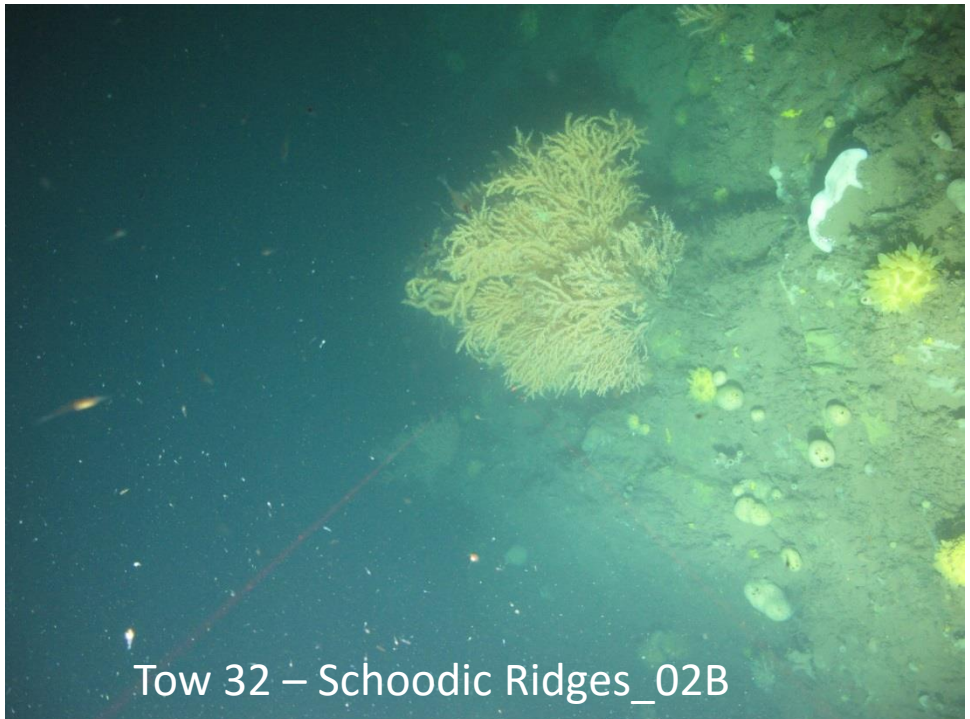
Cerianthus borealis (withdrawn)

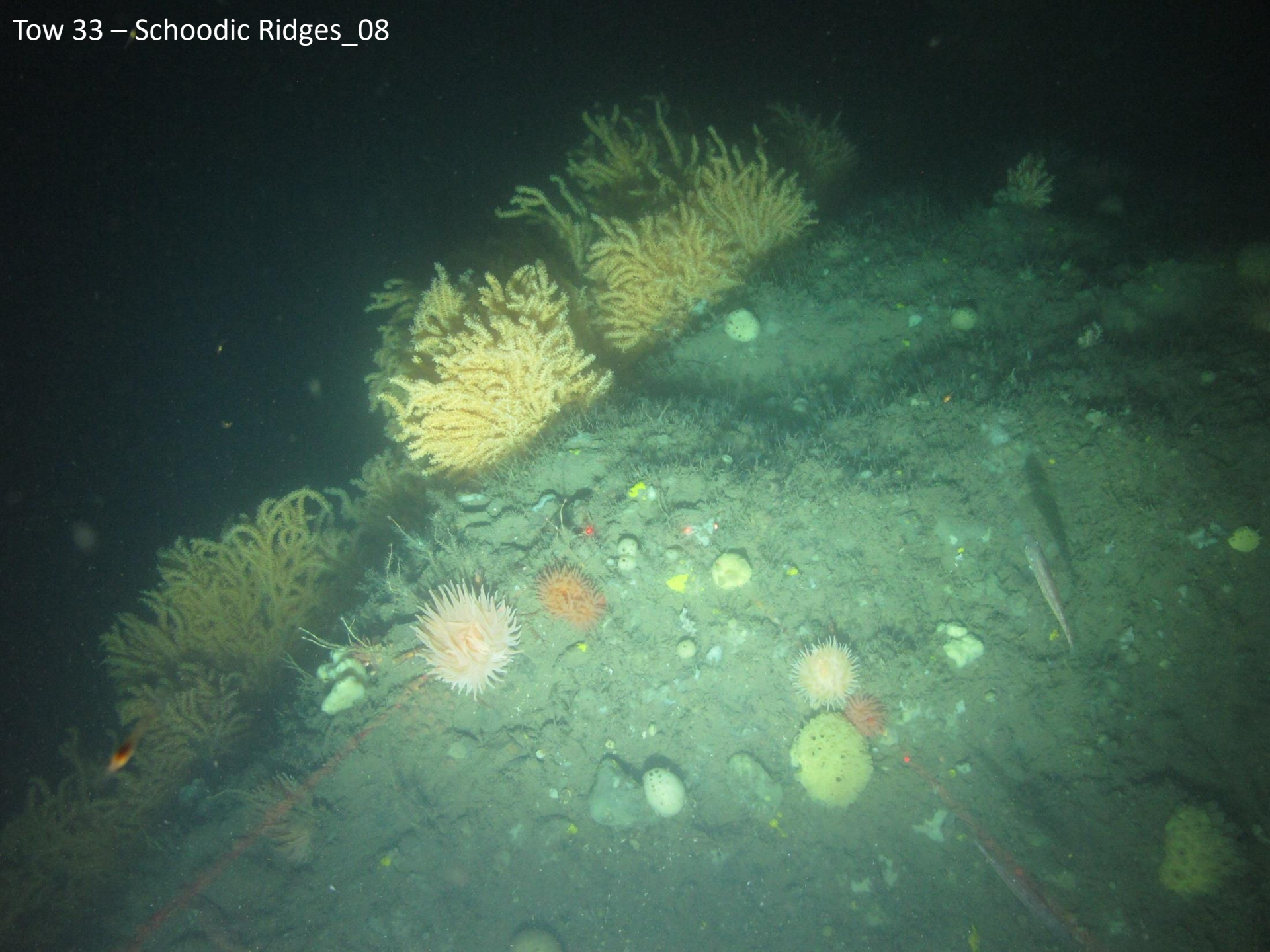
← *Polymastia* sponge

Brachiopod
Terebratulina septentrionalis

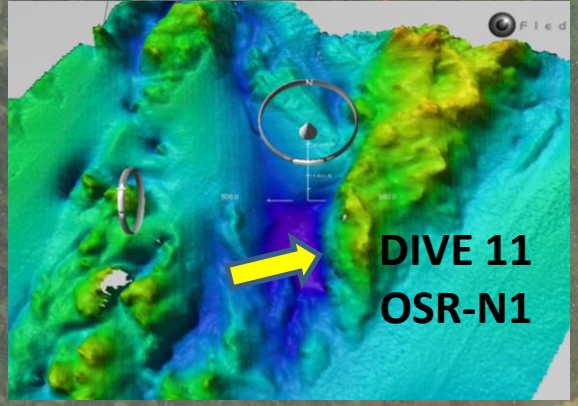


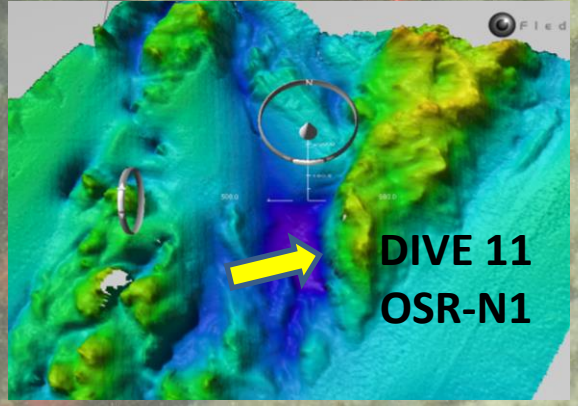

Tow 32 – Schoodic Ridges_02B


Tow 32 – Schoodic Ridges_02B

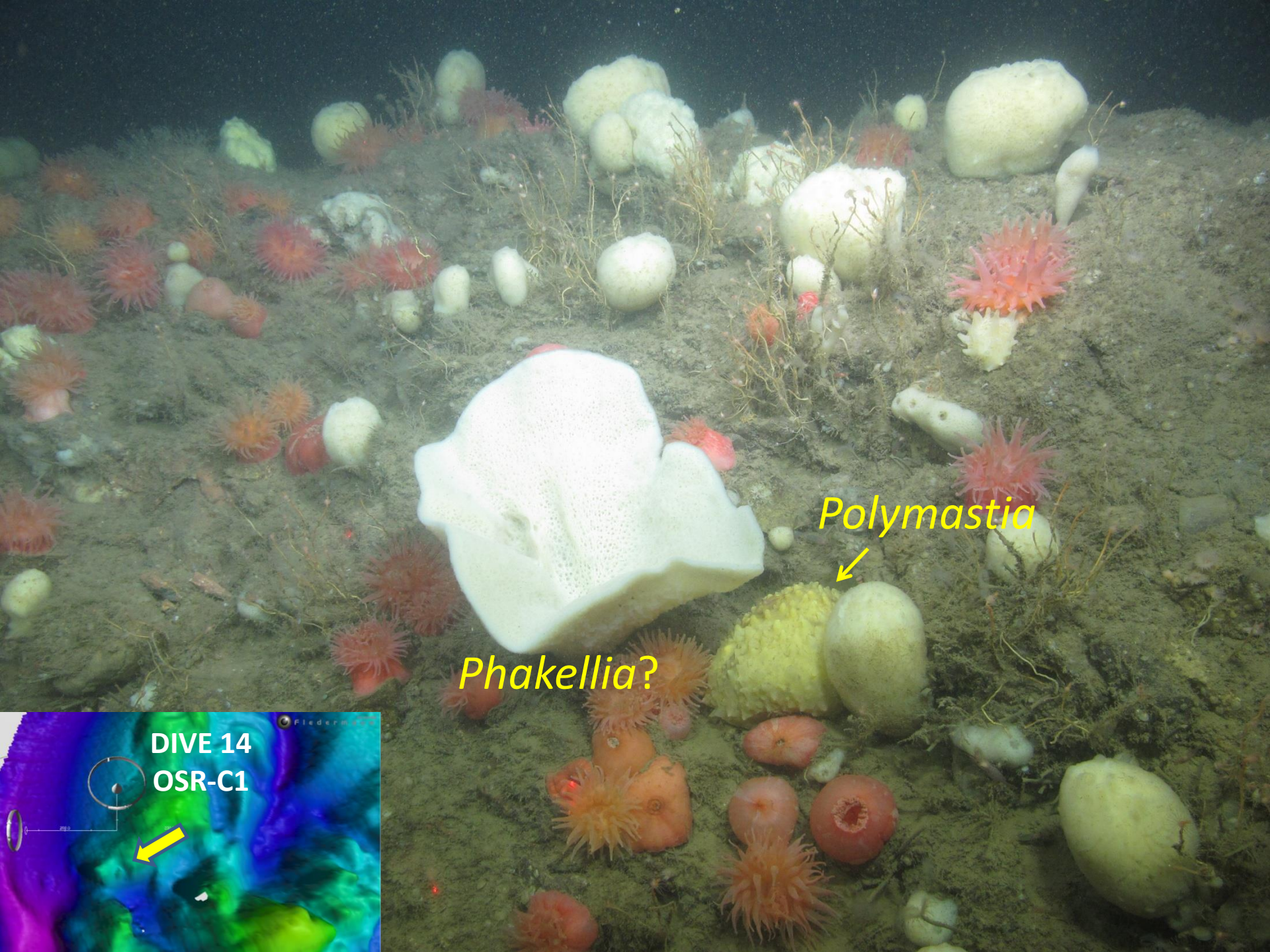

Tow 33 – Schoodic Ridges_08


DIVE 9
OSR_S1A

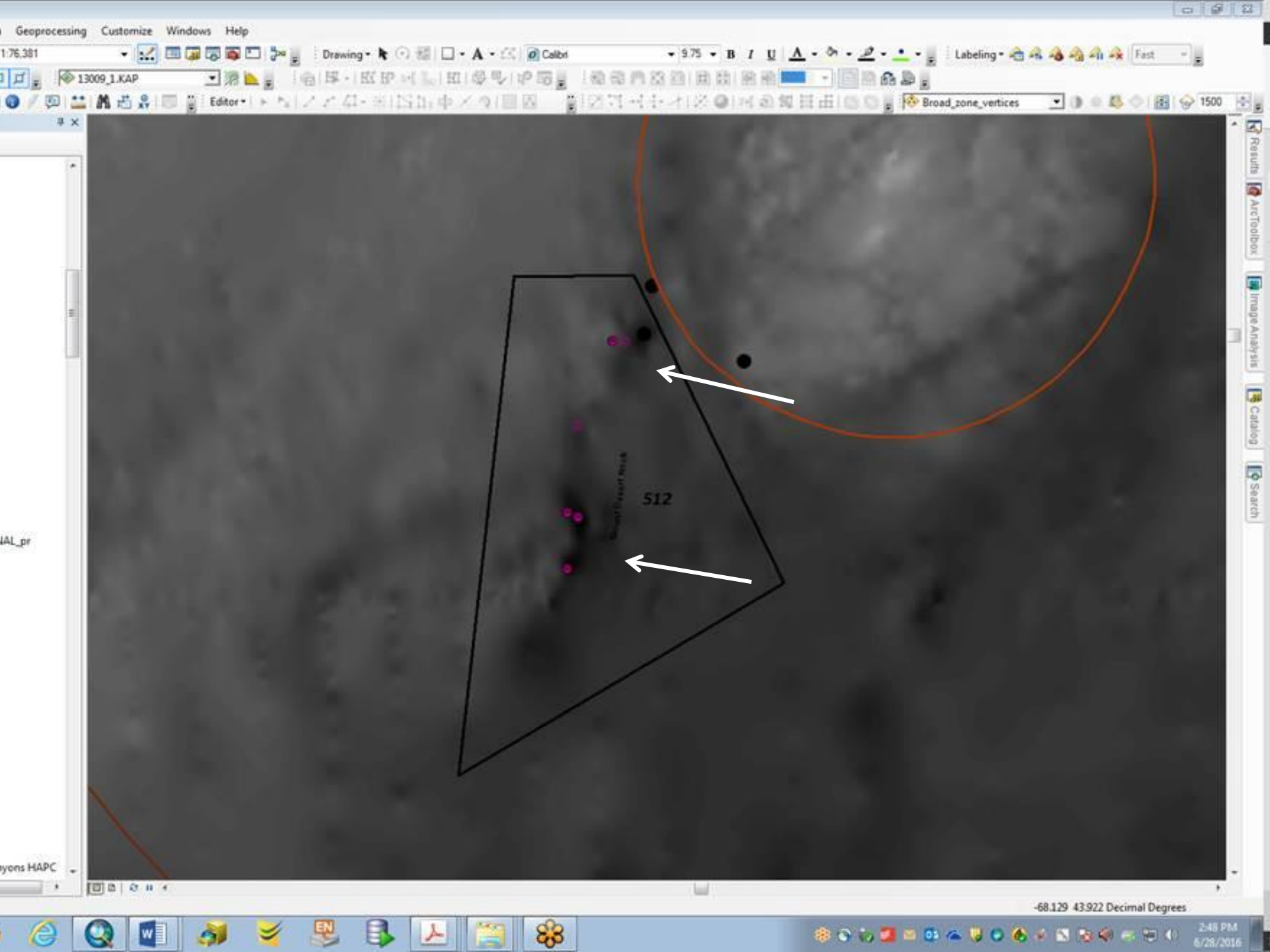

DIVE 11
OSR-N1



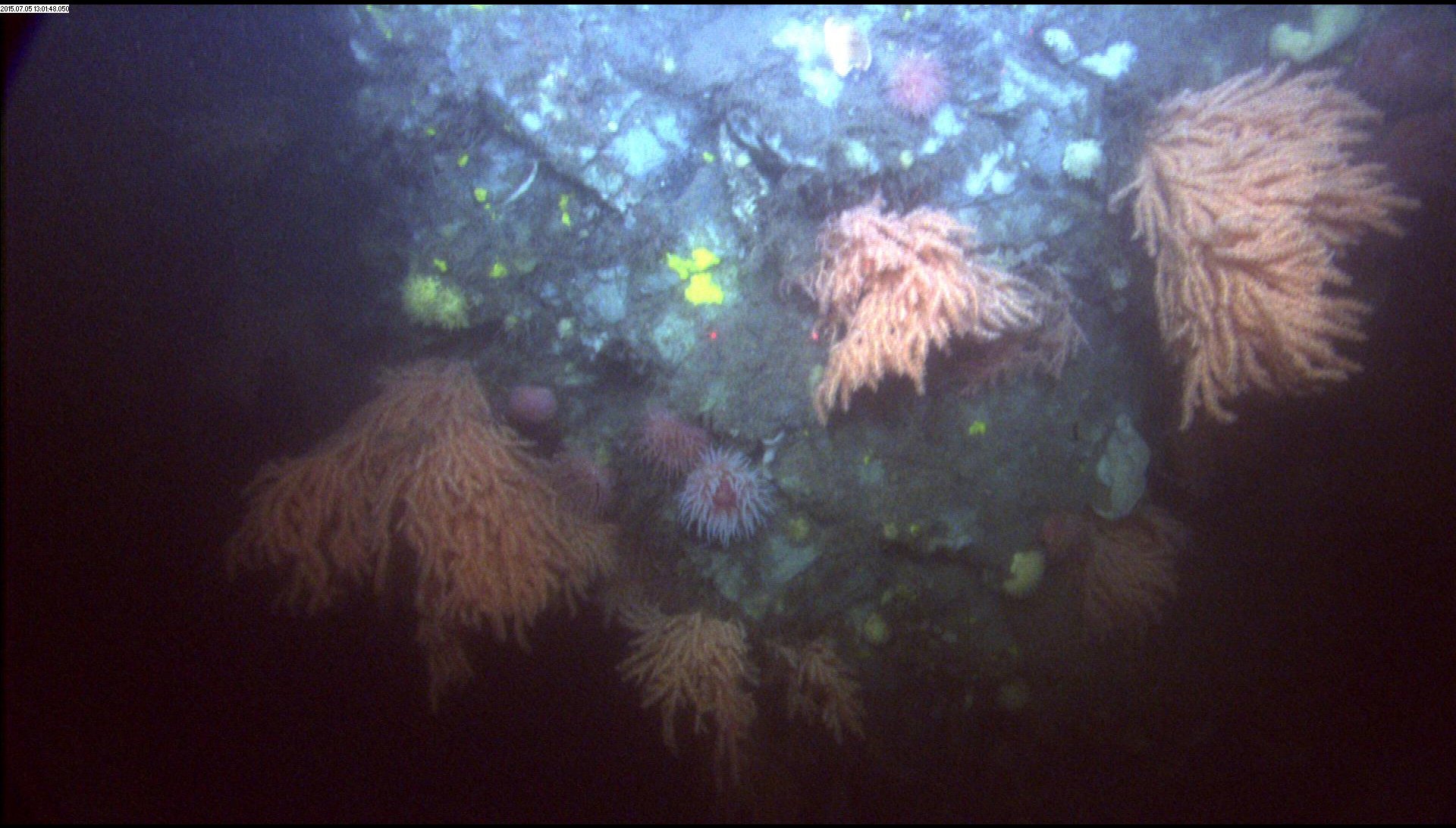
King crab *Lithodes maja*


Polymastia
Phakellia?
DIVE 14
OSR-C1

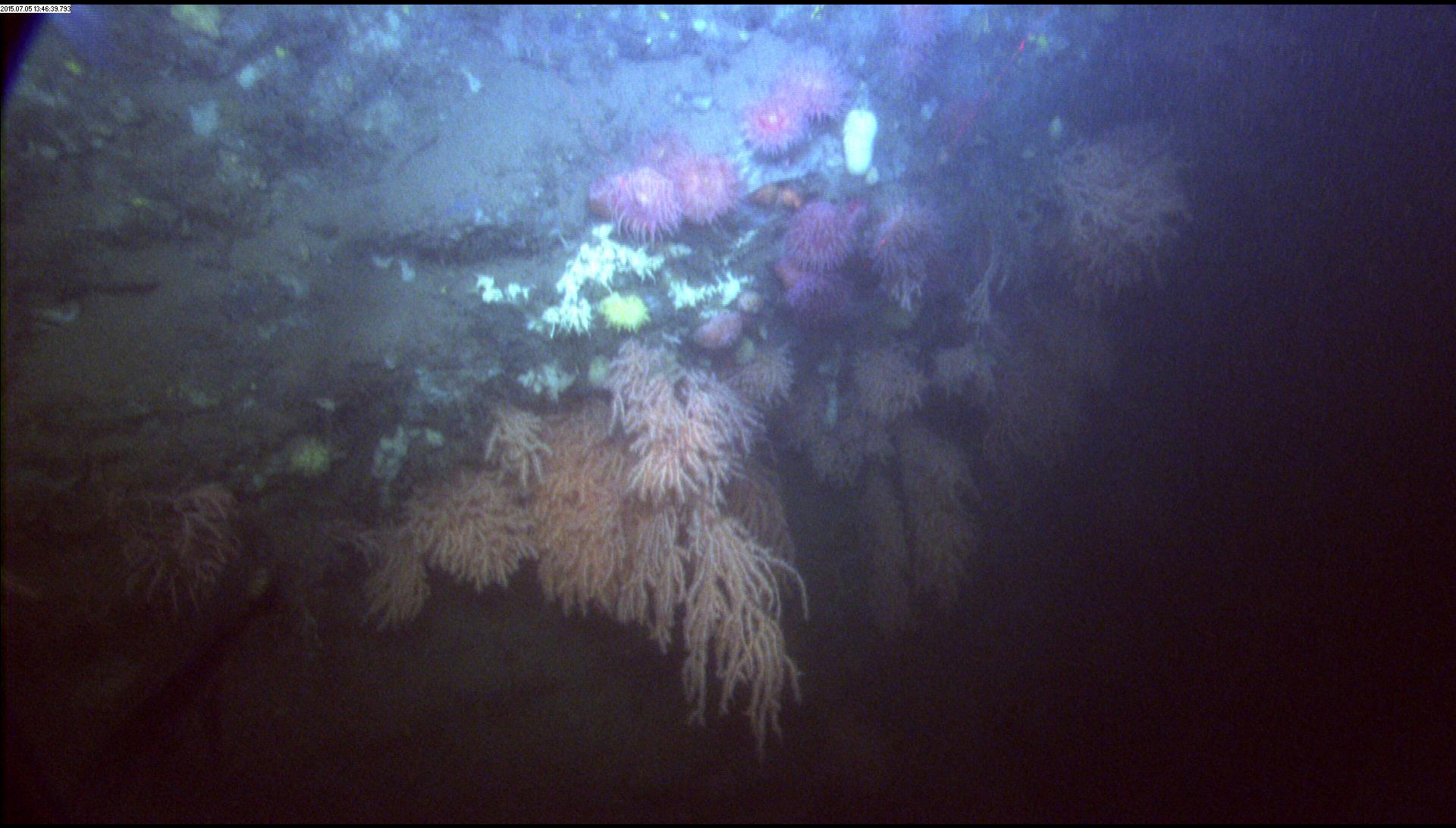

Anthothela sp?


Geoprocessing
Customize
Windows
Help
Drawing
Labeling
13009_1.KAP
Editor
Broad_zone_vertices
512
Results
ArcToolbox
Image Analysis
Catalog
Search
-68.129 43.922 Decimal Degrees
2:48 PM
6/28/2016

MDR Tow 11

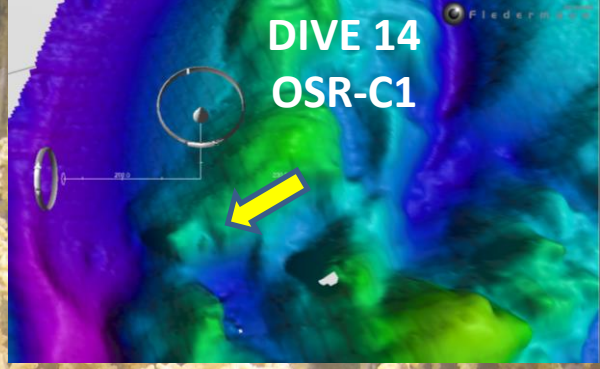


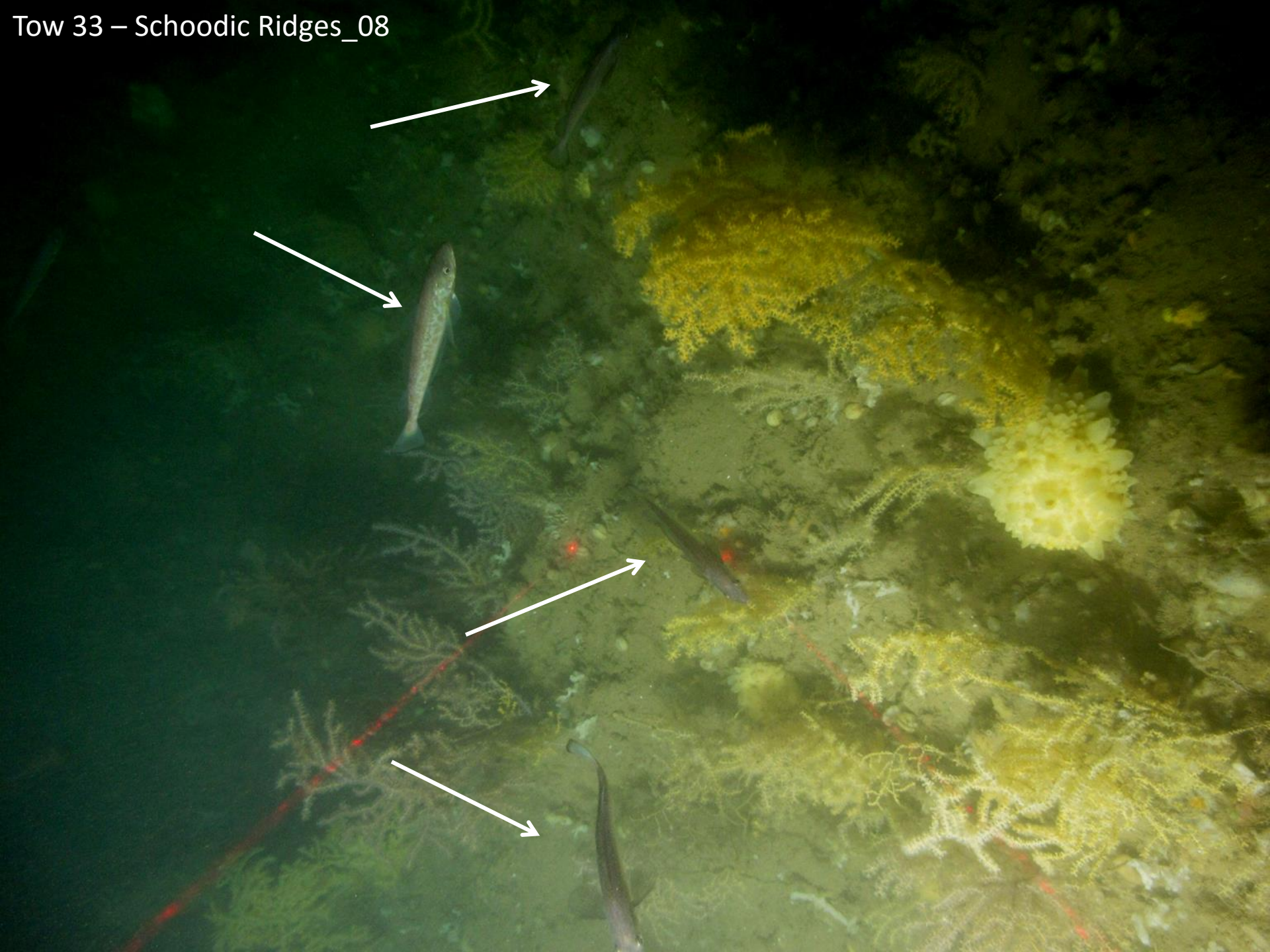
MDR Tow 11



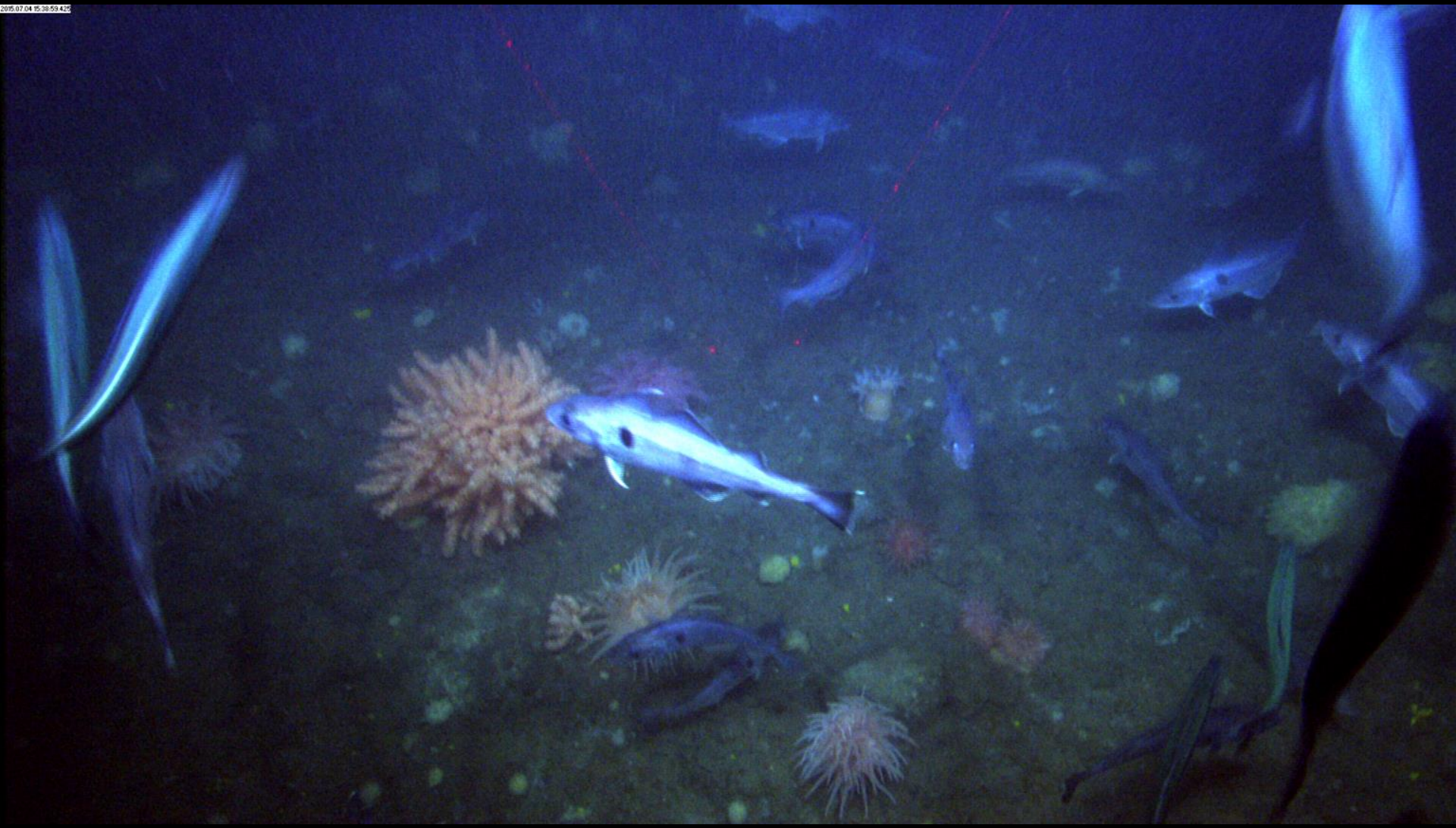
Lindenkohl Knoll Tow 17

Functional Role

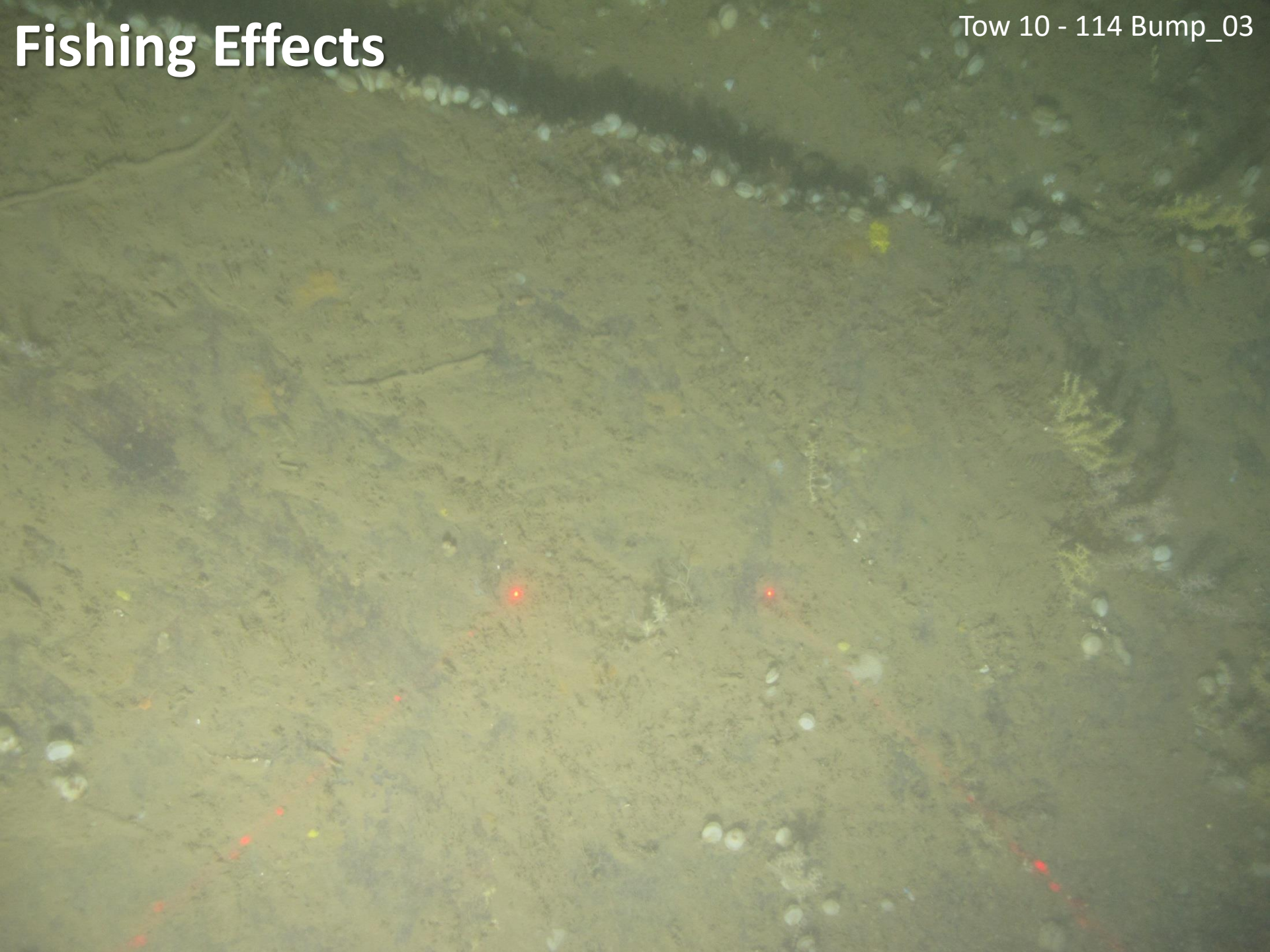


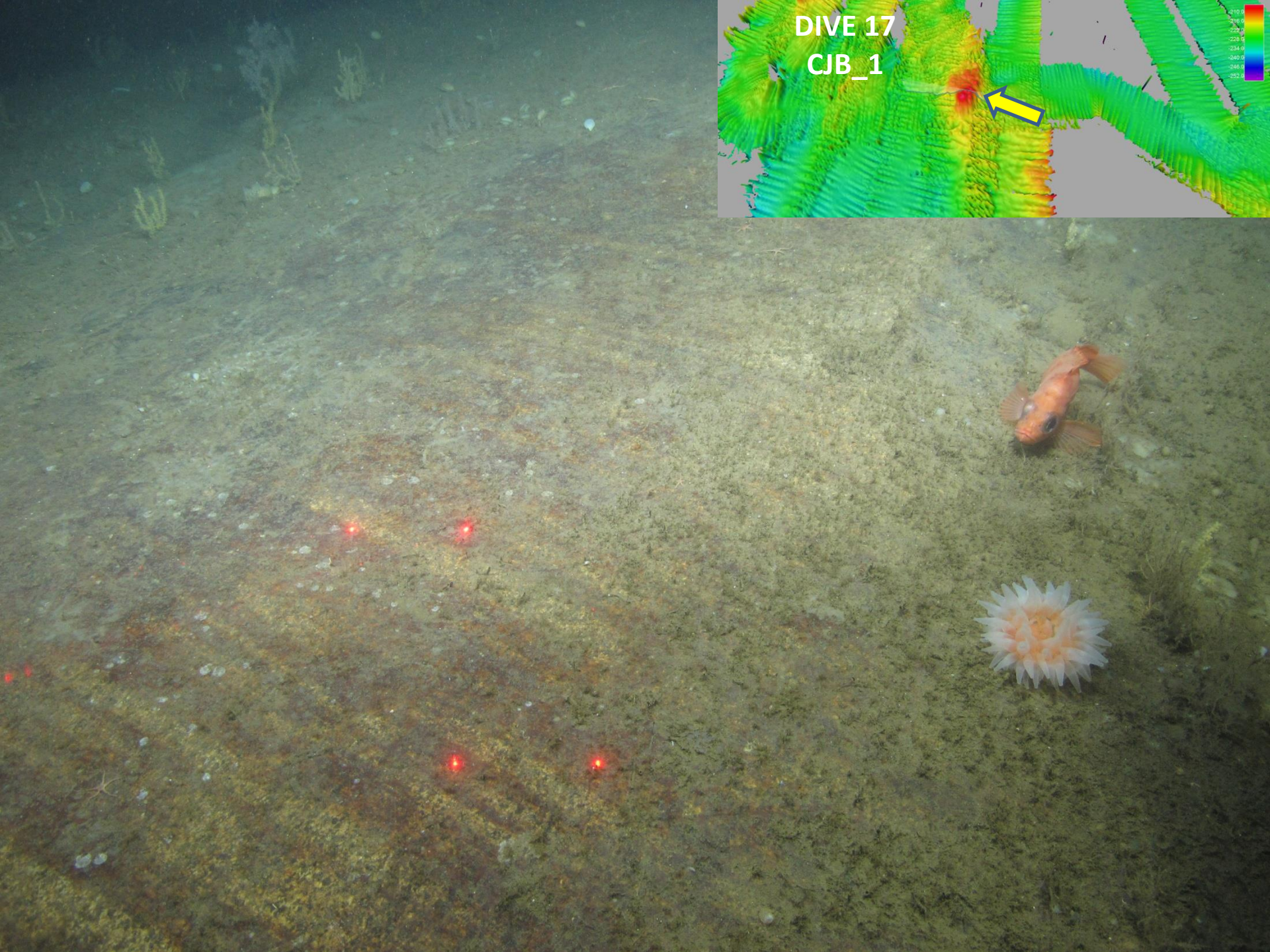

Tow 33 – Schoodic Ridges_08

2015 Tow 7

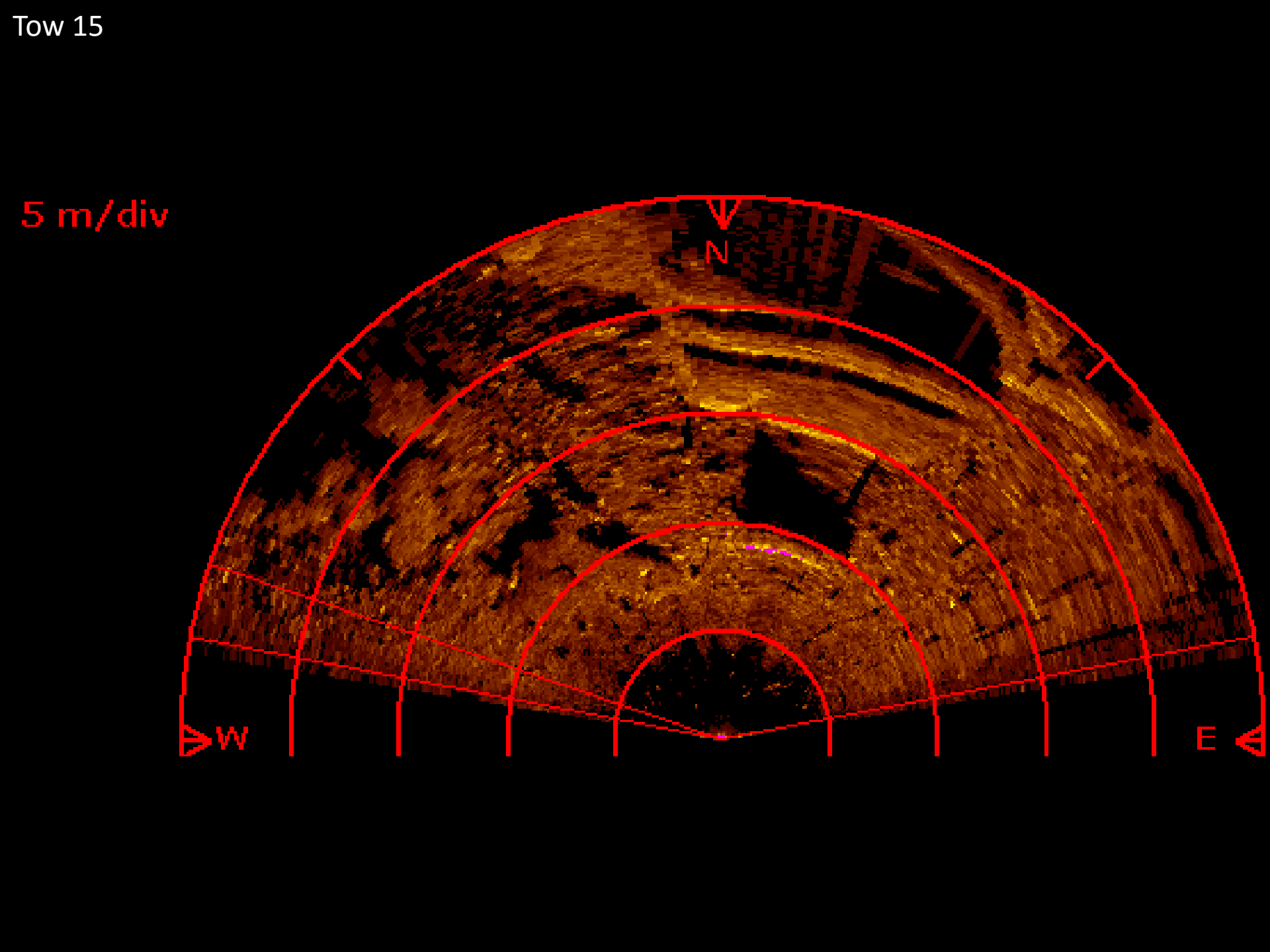


Fishing Effects

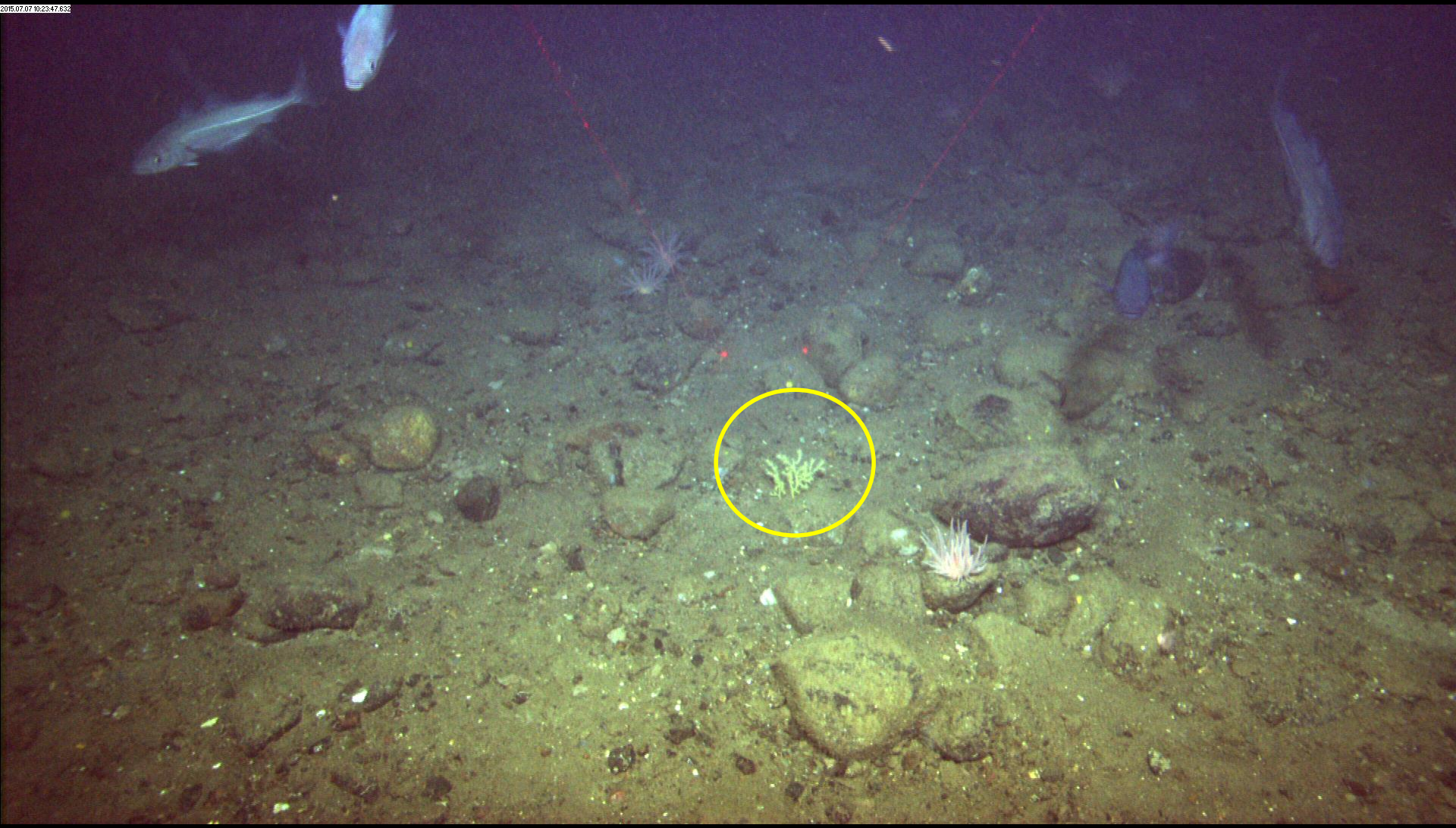



DIVE 17
CJB_1

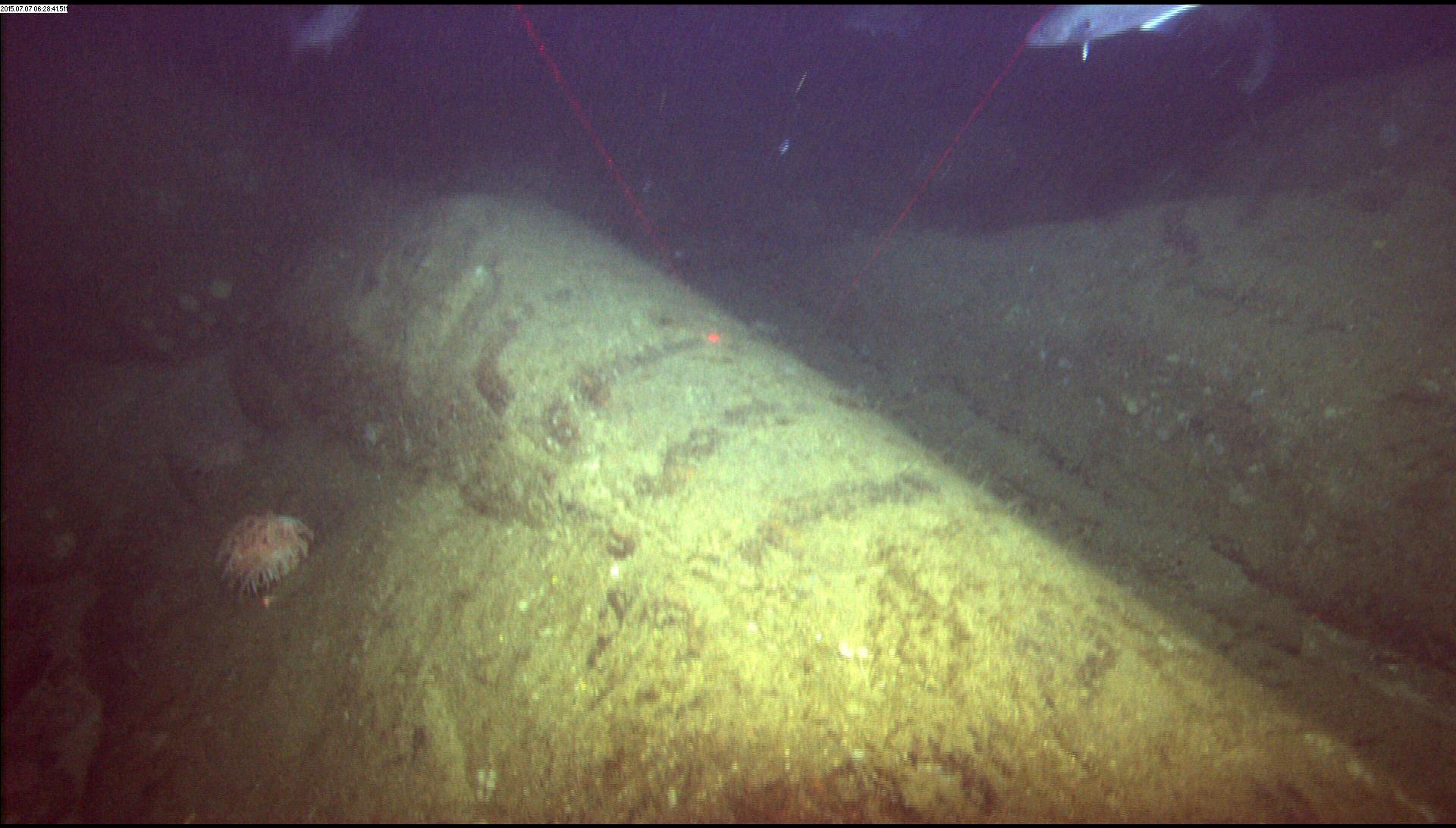
Tow 15



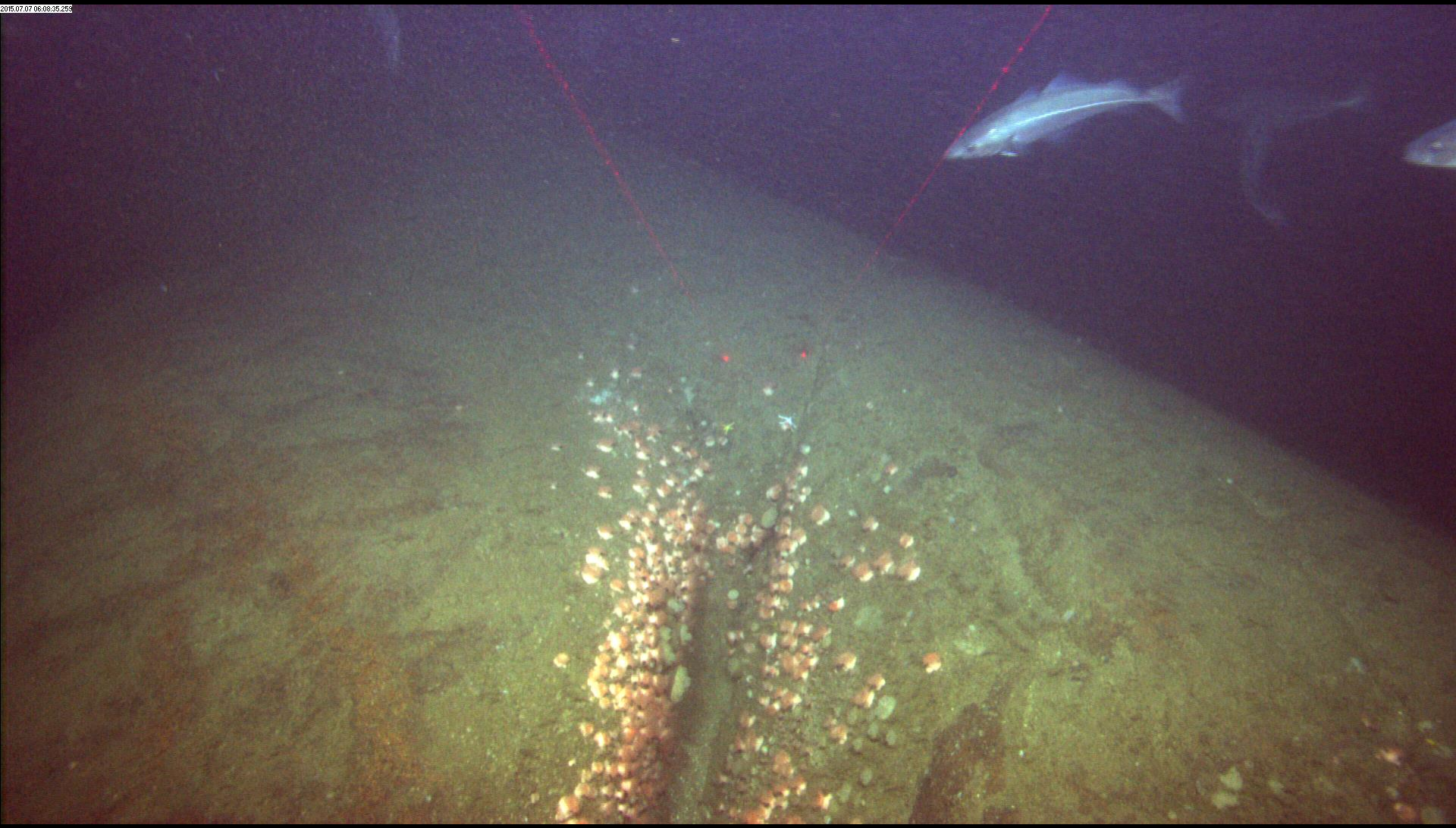
Tow 16



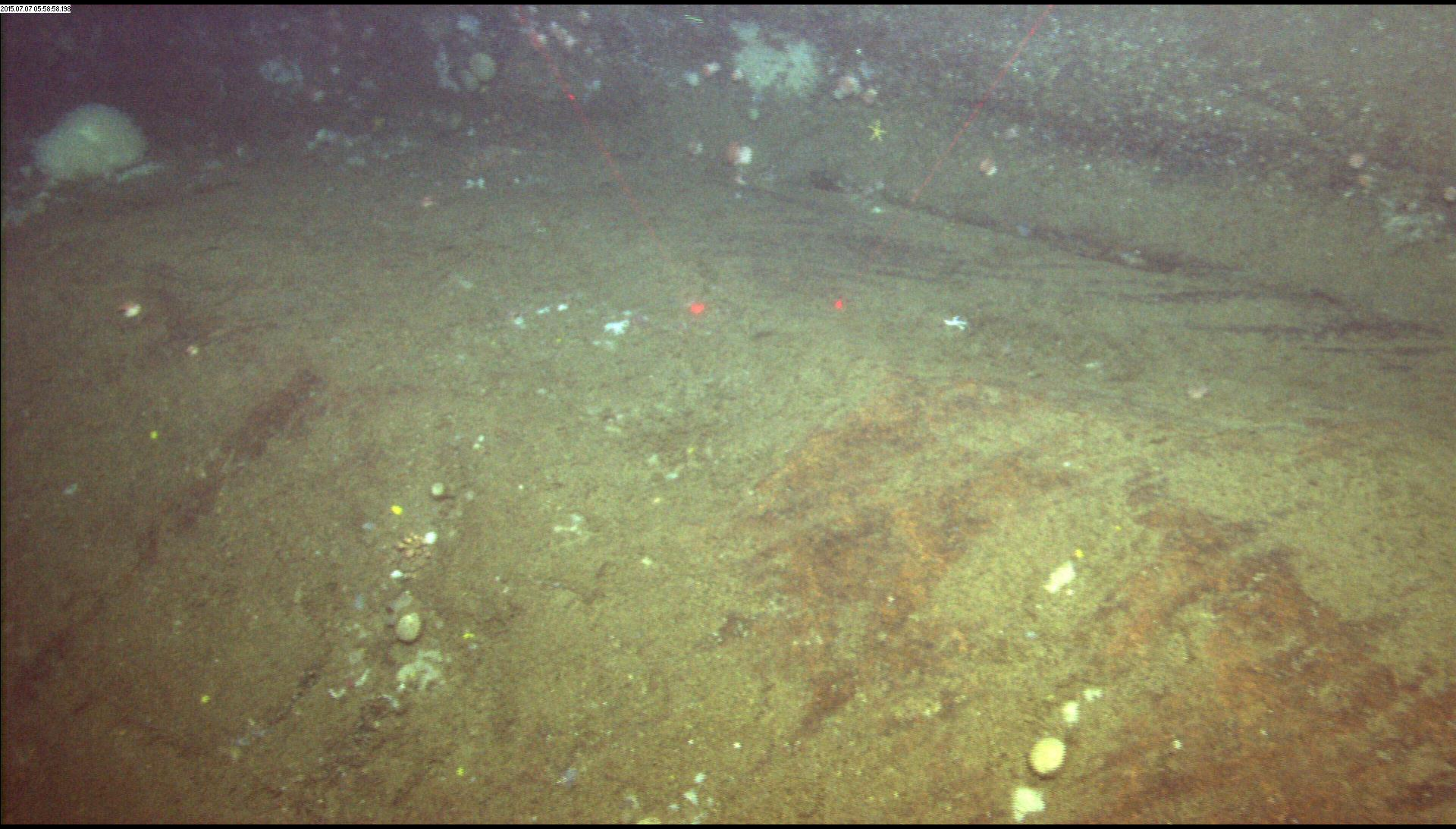
Tow 15



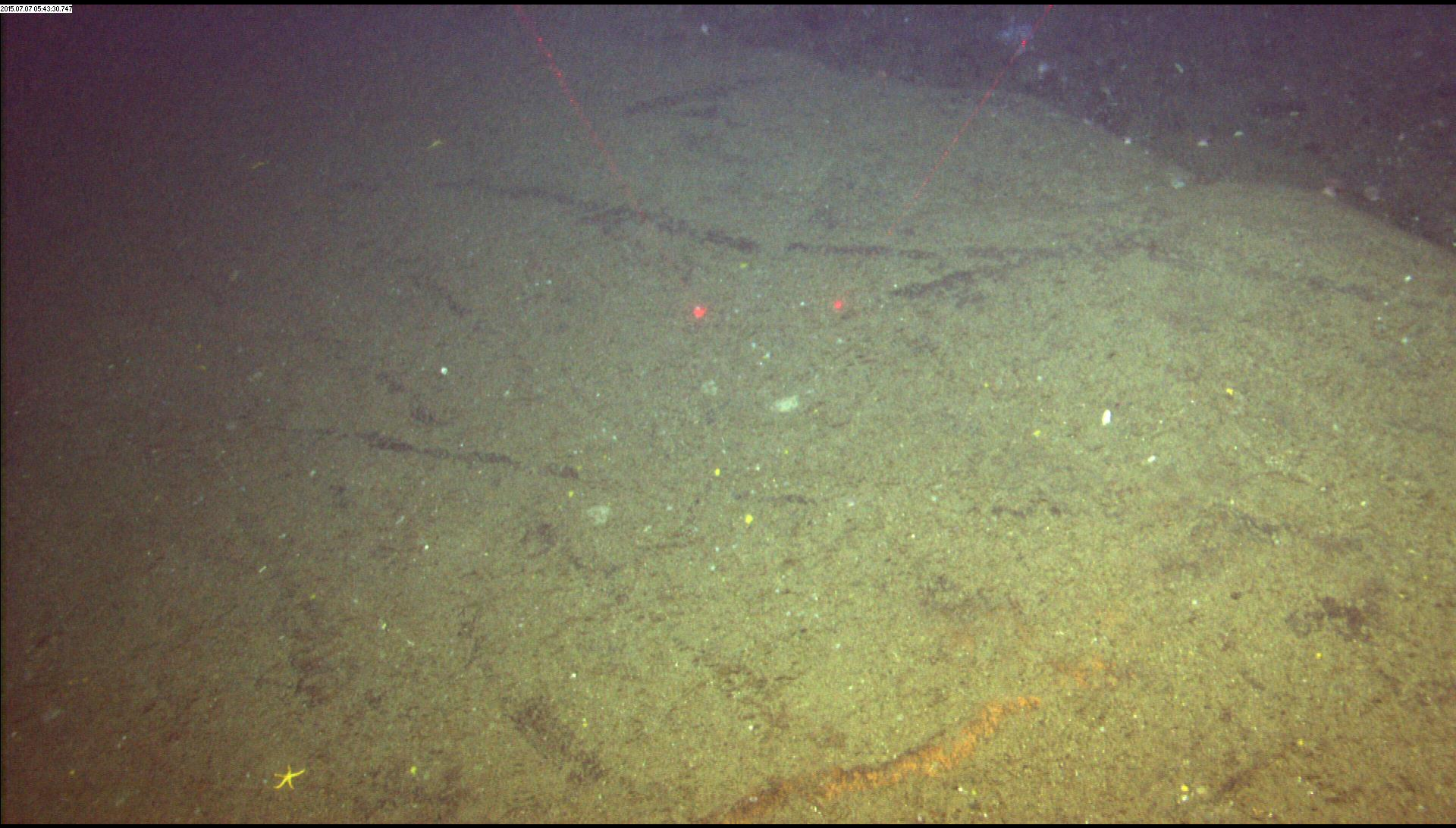
Tow 15

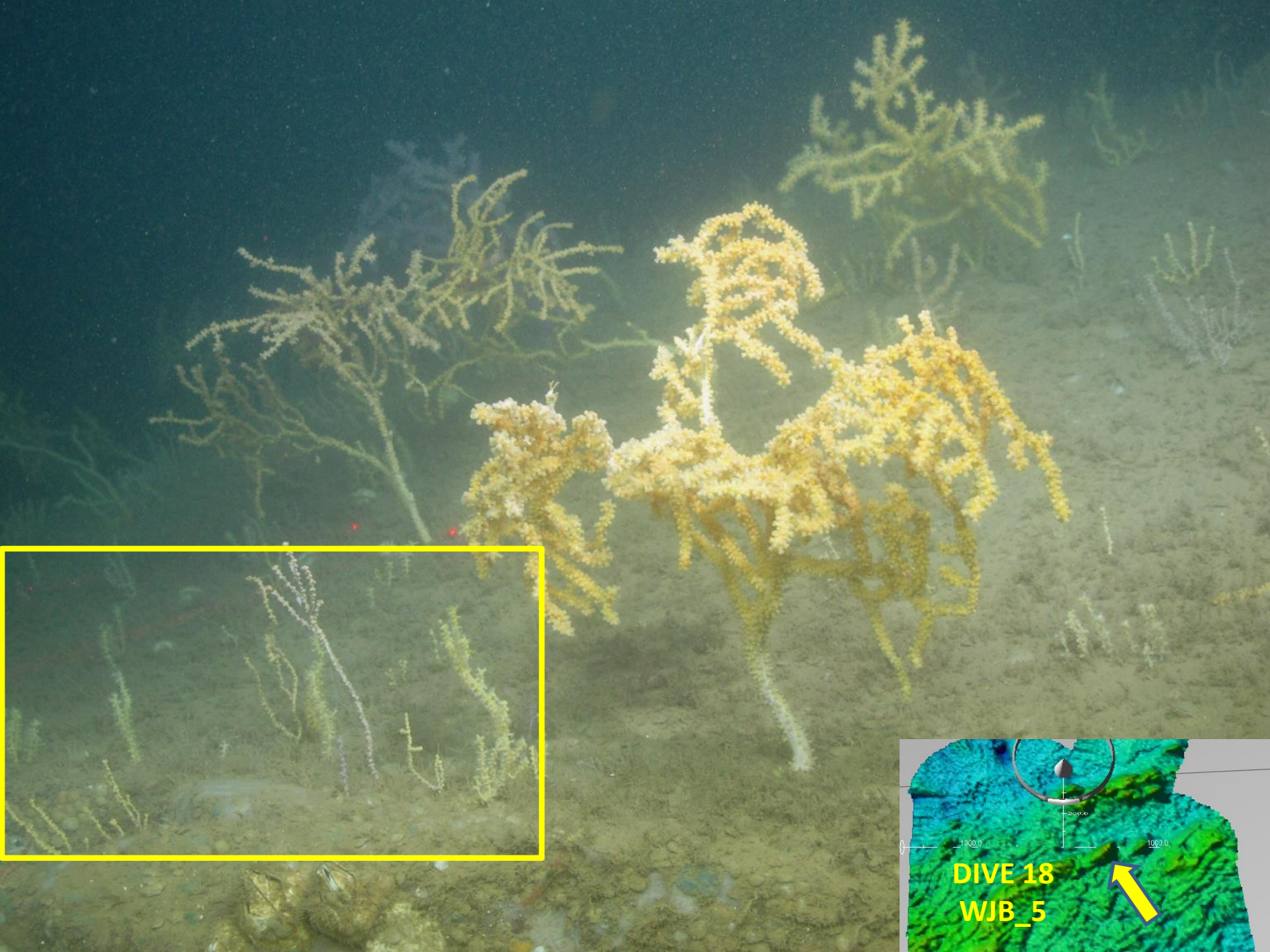


Tow 15



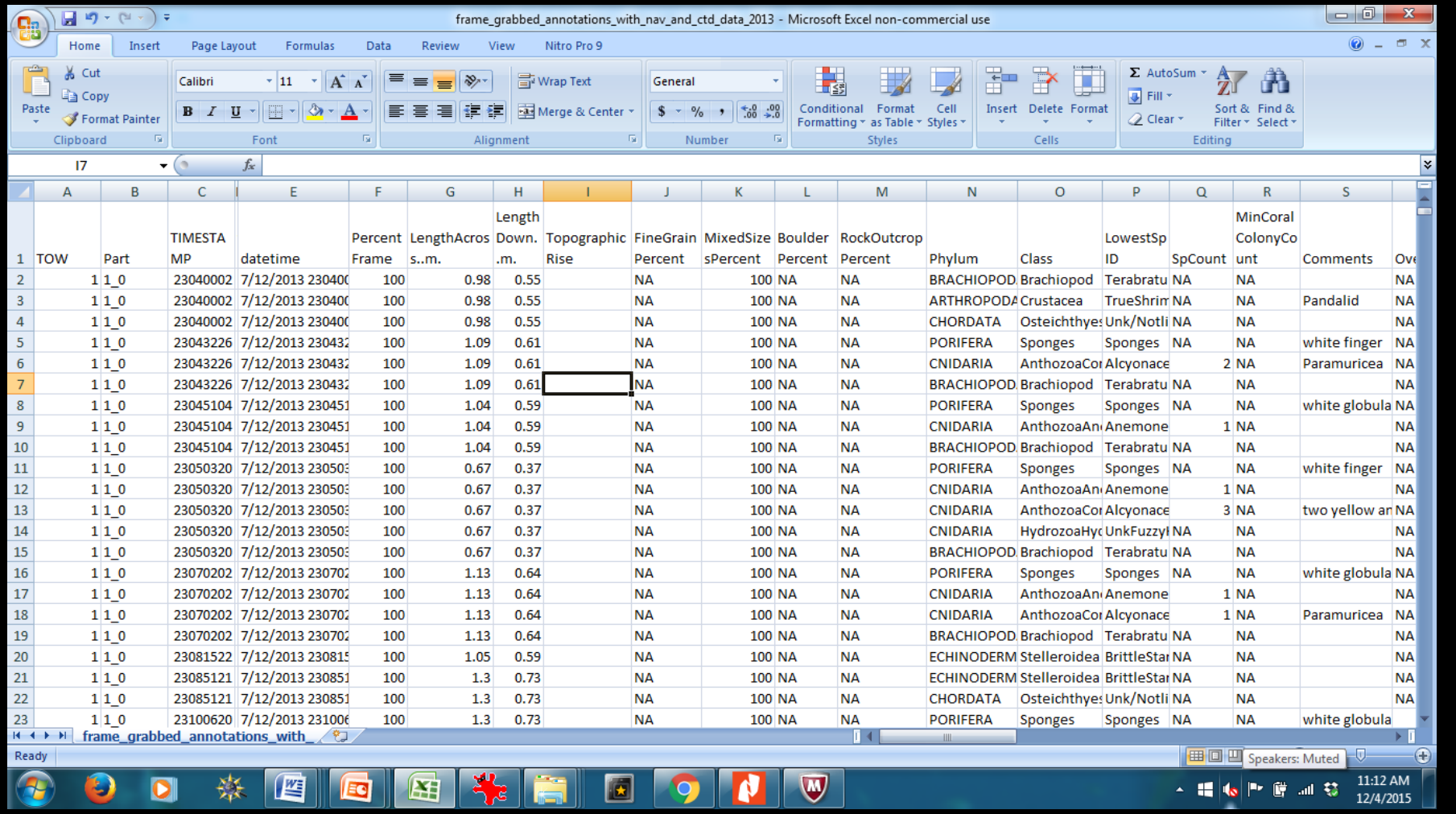
Tow 15




DIVE 18
WJB_5

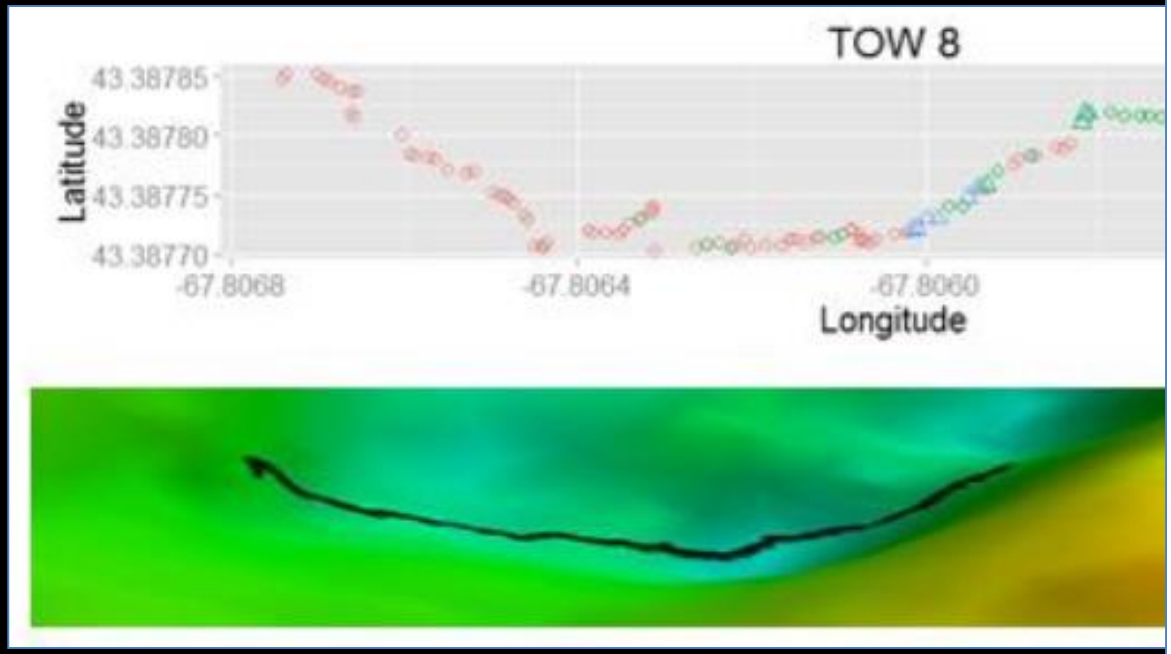

DIVE 15
OSR-S1
Hippasteria phrygiana

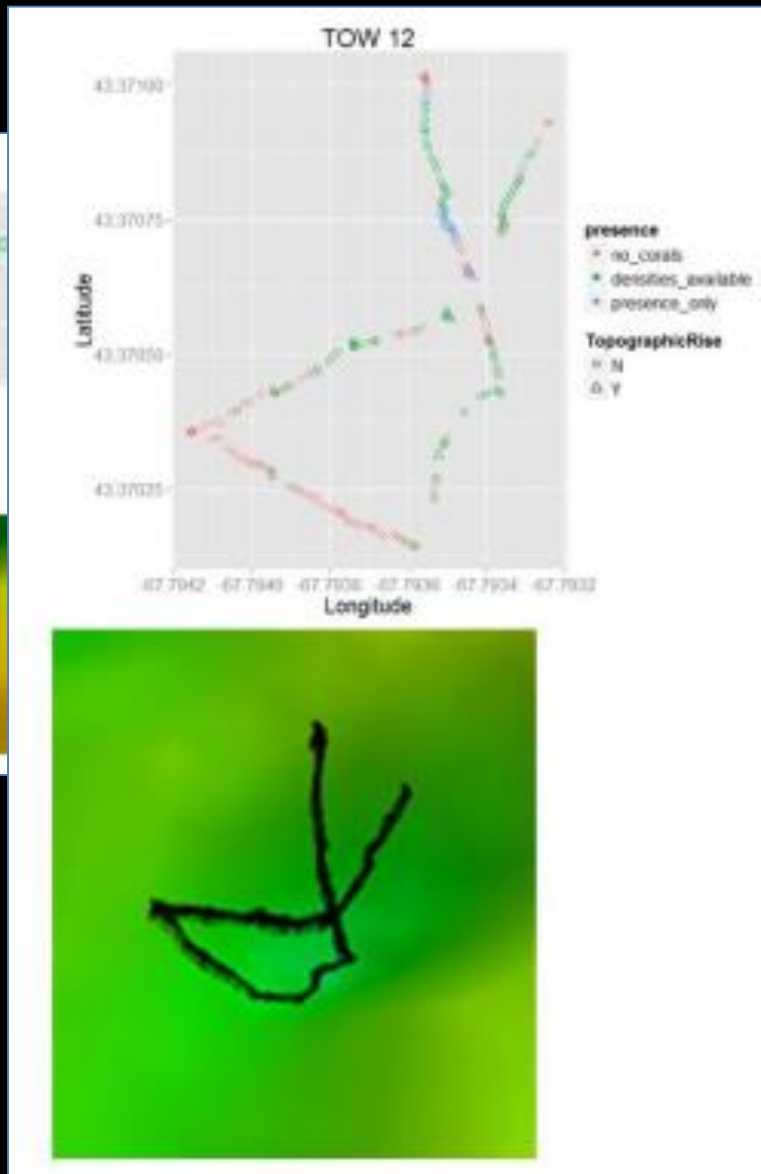
Workflow Example: 2013 Select Tows



	A	B	C	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
1	TOW	Part	TIMESTAMP	datetime	PercentFrame	LengthAcross..m.	LengthDown..m.	TopographicRise	FineGrainPercent	MixedSizesPercent	BoulderPercent	RockOutcropPercent	Phylum	Class	LowestSpID	SpCount	MinCoralColonyCount	Comments	Ove
2	1	1_0	23040002	7/12/2013 230400	100	0.98	0.55		NA	100	NA	NA	BRACHIOPOD	Brachiopod	Terabratu	NA	NA		NA
3	1	1_0	23040002	7/12/2013 230400	100	0.98	0.55		NA	100	NA	NA	ARTHROPODA	Crustacea	TrueShrim	NA	NA	Pandalid	NA
4	1	1_0	23040002	7/12/2013 230400	100	0.98	0.55		NA	100	NA	NA	CHORDATA	Osteichthyes	Unk/Notli	NA	NA		NA
5	1	1_0	23043226	7/12/2013 230432	100	1.09	0.61		NA	100	NA	NA	PORIFERA	Sponges	Sponges	NA	NA	white finger	NA
6	1	1_0	23043226	7/12/2013 230432	100	1.09	0.61		NA	100	NA	NA	CNIDARIA	AnthozoaCor	Alcyonace	2	NA	Paramuricea	NA
7	1	1_0	23043226	7/12/2013 230432	100	1.09	0.61		NA	100	NA	NA	BRACHIOPOD	Brachiopod	Terabratu	NA	NA		NA
8	1	1_0	23045104	7/12/2013 230451	100	1.04	0.59		NA	100	NA	NA	PORIFERA	Sponges	Sponges	NA	NA	white globula	NA
9	1	1_0	23045104	7/12/2013 230451	100	1.04	0.59		NA	100	NA	NA	CNIDARIA	AnthozoaAn	Anemone	1	NA		NA
10	1	1_0	23045104	7/12/2013 230451	100	1.04	0.59		NA	100	NA	NA	BRACHIOPOD	Brachiopod	Terabratu	NA	NA		NA
11	1	1_0	23050320	7/12/2013 230503	100	0.67	0.37		NA	100	NA	NA	PORIFERA	Sponges	Sponges	NA	NA	white finger	NA
12	1	1_0	23050320	7/12/2013 230503	100	0.67	0.37		NA	100	NA	NA	CNIDARIA	AnthozoaAn	Anemone	1	NA		NA
13	1	1_0	23050320	7/12/2013 230503	100	0.67	0.37		NA	100	NA	NA	CNIDARIA	AnthozoaCor	Alcyonace	3	NA	two yellow ar	NA
14	1	1_0	23050320	7/12/2013 230503	100	0.67	0.37		NA	100	NA	NA	CNIDARIA	HydrozoaHyd	UnkFuzzyI	NA	NA		NA
15	1	1_0	23050320	7/12/2013 230503	100	0.67	0.37		NA	100	NA	NA	BRACHIOPOD	Brachiopod	Terabratu	NA	NA		NA
16	1	1_0	23070202	7/12/2013 230702	100	1.13	0.64		NA	100	NA	NA	PORIFERA	Sponges	Sponges	NA	NA	white globula	NA
17	1	1_0	23070202	7/12/2013 230702	100	1.13	0.64		NA	100	NA	NA	CNIDARIA	AnthozoaAn	Anemone	1	NA		NA
18	1	1_0	23070202	7/12/2013 230702	100	1.13	0.64		NA	100	NA	NA	CNIDARIA	AnthozoaCor	Alcyonace	1	NA	Paramuricea	NA
19	1	1_0	23070202	7/12/2013 230702	100	1.13	0.64		NA	100	NA	NA	BRACHIOPOD	Brachiopod	Terabratu	NA	NA		NA
20	1	1_0	23081522	7/12/2013 230815	100	1.05	0.59		NA	100	NA	NA	ECHINODERM	Stelleroidea	BrittleStar	NA	NA		NA
21	1	1_0	23085121	7/12/2013 230851	100	1.3	0.73		NA	100	NA	NA	ECHINODERM	Stelleroidea	BrittleStar	NA	NA		NA
22	1	1_0	23085121	7/12/2013 230851	100	1.3	0.73		NA	100	NA	NA	CHORDATA	Osteichthyes	Unk/Notli	NA	NA		NA
23	1	1_0	23100620	7/12/2013 231006	100	1.3	0.73		NA	100	NA	NA	PORIFERA	Sponges	Sponges	NA	NA	white globula	

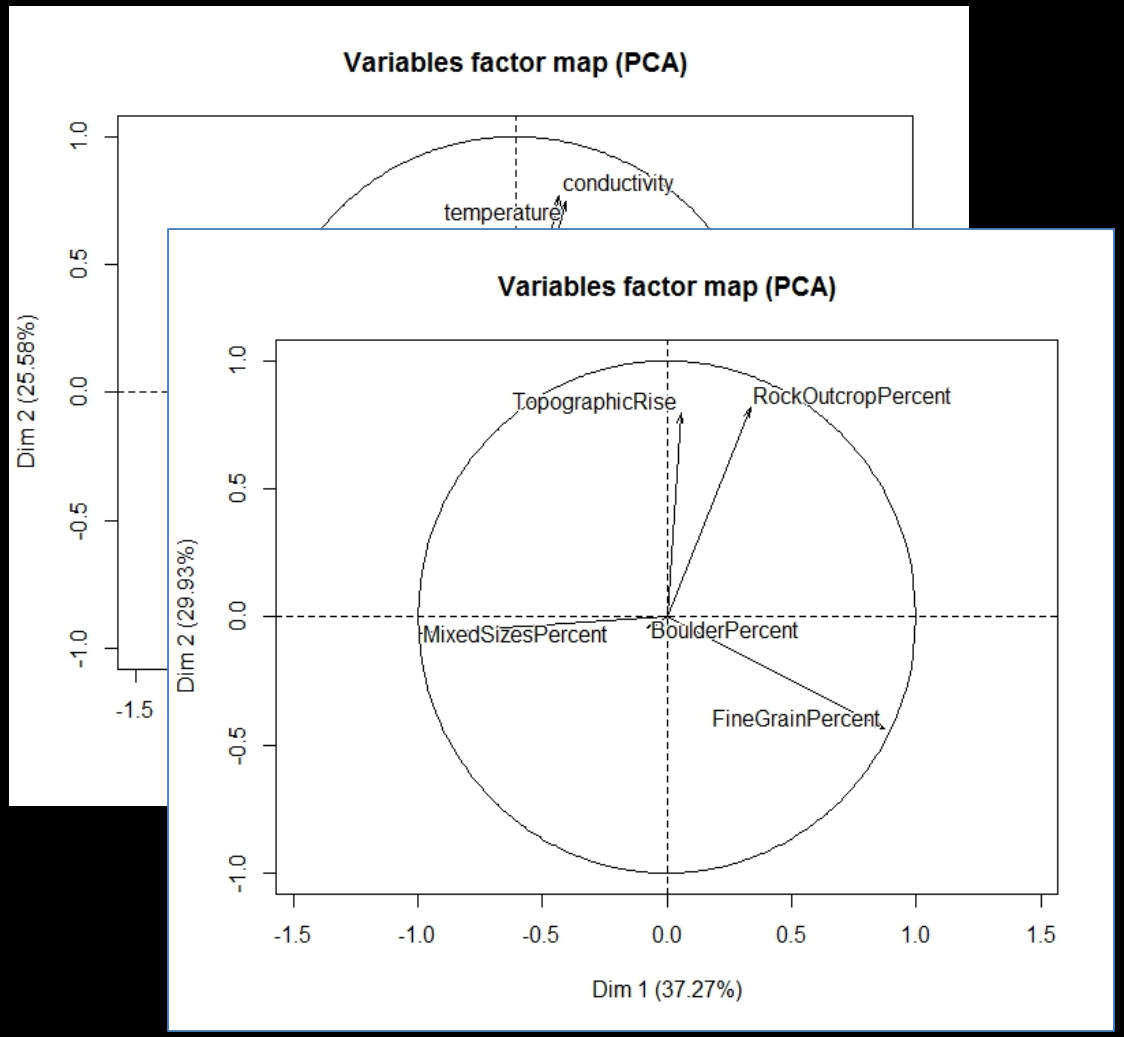
Example: 2013 Select Tows





Caren Martin, MSc Thesis

Workflow Example: 2013 Select Tows



Oceanographic
Temperature
Depth
Geologic
Sediment type
Rock outcrop
Topographic rise
Biologic
Brachiopoda
Anthozoa
Hydrozoa
Porifera

N = 8 tows

THE TAKEAWAY:

Off the Northeast U.S., the largest numbers and highest diversity of deep-sea corals occurs in the deep submarine canyons and seamounts far offshore along the edge of the continental margin. It is amazing to see high densities of at least two of these species, and of such large sizes, in relatively shallow waters (200 m) so close to shore.

Finding these spectacular walls of corals in the Gulf for the first time in 2014, after 40 plus years of research submersible operations, illustrates how much more we need to understand about the Gulf ecosystem in order to better conserve and manage our natural resources.

FINI

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